# Making Representations Matter: Understanding Practitioner Experience in Participatory Sensemaking

## Thesis

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The Open University

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# Making Representations Matter

## Understanding Practitioner Experience in Participatory Sensemaking

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# Abstract

Appropriating new technologies in order to foster collaboration and participatory engagement is a focus for many fields, but there is relatively little research on the experience of practitioners who do so. The role of technology-use mediators is to help make such technologies amenable and of value to the people who interact with them and each other. When the nature of the technology is to provide textual and visual representations of ideas and discussions, issues of form and shaping arise, along with questions of professional ethics. This thesis examines such *participatory representational practice,* specifically how practitioners make participatory visual representations (pictures, diagrams, knowledge maps) coherent, engaging and useful for groups tackling complex societal and organizational challenges. This thesis develops and applies a method to analyze, characterize, and compare instances of participatory representational practice in such a way as to highlight experiential aspects such as aesthetics, narrative, improvisation, sensemaking, and ethics. It extends taxonomies of such practices found in related research, and contributes to a critique of functionalist or techno-rationalist approaches to studying professional practice. It studies how fourteen practitioners using a visual hypermedia tool engaged participants with the hypermedia representations, and the ways they made the representations matter to the participants. It focuses on the sensemaking challenges that the practitioners encountered in their sessions, and on the ways that the form they gave the visual representations (aesthetics) related to the service they were trying to provide to their participants. Qualitative research methods such as grounded theory are employed to analyze video recordings of the participatory representational sessions. Analytical tools were developed to provide a multi-perspective view on each session. Conceptual and normative frameworks for understanding the practitioner experience in participatory representational practice in context, especially in terms of aesthetics, ethics, narrative, sensemaking, and improvisation, are proposed. The thesis places these concerns in context of other kinds of facilitative and mediation practices as well as research on reflective practice, aesthetic experience, critical HCI, and participatory design.

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## Preface

In the 1990s I worked in an expert systems research and development group inside a large telecommunications company. Our projects combined participatory design, business process modeling, and software development. Responding to the need to bridge these disciplines, we developed the Compendium methodology and hypermedia toolset,[1] which brought together facilitative approaches with analysis, modeling, and project management materials. Evolving the approach over several years, we worked with many different groups in diverse settings, often experiencing profound engagement with the tools, representations, and our participants. Yet, when I examined the research literature in hypermedia, computer-supported cooperative work (CSCW), human-computer interaction (HCI), group support systems (GSS), and related fields, I found little or no work that addressed or explained such experiences, or shed light on what seemed to me their central phenomena: the aesthetic, improvisational, ethical, narrative, and sensemaking dimensions of the encounter of skilled practitioner, representational artifact, participants, and methods. What work touched on these subjects did so only in passing. I felt that these experiences were both genuine and of worthy of research interest. Understanding these dimensions might lead to breakthroughs in tool support, method development, and practitioner training. This thesis is the culmination of a research effort aimed at uncovering and highlighting these aspects of practitioner experience.

[1] See http://compendium.open.ac.uk/institute.

# 1 Introduction

In *Reflection in Action* (1983), Donald Schön articulated a challenge to researchers looking for ways to pull understanding of the professions away from rationalist concepts of expert practice. Such concepts ascribed professionalism to the ability to choose and apply techniques learned in school to prescribed types of situations. Schön insisted that there is an artistry to professional practice that, although difficult to describe, nonetheless informs and shapes what practitioners actually do:

> Let us search … for an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict. (1983: 49)

This thesis intends to contribute to that search by developing and applying a method to analyze, characterize, and compare instances of professional practice in such a way as to highlight experiential aspects such as aesthetics, narrative, improvisation, sensemaking, and ethics.

The thesis further seeks to extend taxonomies of such practices found in related research, and to contribute to a critique of functionalist or techno-rationalist (Schön, 1983) approaches to studying professional practice as well as to an experiential replacement for the techno-rationalist approach. While focusing on a particular form of professional practice called *participatory representational practice* – helping groups of people create visual representations of issues of importance to them – the considerations developed in the thesis are applicable to the broader concerns articulated in the following section.

The terms describing the experiential dimensions of central interest – aesthetics, ethics, narrative, sensemaking, and improvisation – have many meanings in the literature. Table 1.1 defines how they will be used to refer to participatory representational practice in this thesis.

**Table 1.1: Dimensions of participatory representational practitioner experience**

| Practice Dimension | Definition |
|---|---|
| Aesthetics | How practitioners shape and craft a visual and textual representation |
| Ethics | How practitioner actions affect other people, especially participants and other stakeholders |
| Narrative | How meaning and causality apply to the flow of events in a session |
| Sensemaking | The ways in which practitioners deal with situations of doubt, anomaly, or instability |
| Improvisation | The spontaneous, creative moves that practitioners can make, often in response to sensemaking moments |

Chapter 2 expands on these definitions. Schön and others call for expanded attention to these dimensions in studies of professional practice, and criticize accounts of practice that underemphasize such experiential aspects. The following section describes these critiques.

## 1.1 Critical viewpoints on practice research

This section describes the critique of functionalist or techno-rationalist approaches to studying professional practice as reflected in a number of fields, as well as the directions such critics prescribe in response. Following this, it positions this thesis with regard to both the critique and response.

### 1.1.1 Critique of techno-rational approaches to practice

Researchers in a number of related fields argue that much of the literature on professional practice is deficient in its understanding of practice in experiential terms. The literature around professional practice or "expert servicing" (Goffman, 1967, quoted in Aakhus, 2001) has a long tradition of critique of the idea that such practice can be understood, and progress made in the field, solely on the basis of techno-rational accounts of practice (Schön, 1983). Techno-rational and functional accounts offer prescriptive advice: Actions of type A in situations of type B will result in outcomes of type C. The critique centers on the following three ways that such research:

- **… fails to describe experiential dimensions of professional practice**. Prescriptive, techno-rational, or functionalist literature misses the texture of actual practitioner experience. By focusing on generalized or measurable phenomena, it obscures or avoids the subjectivity, messiness and situation-specific nature of professional action. Especially missed is what constitutes the domain of aesthetics – the choices practitioners make in the shaping of their artifacts and discourses, in the ways they improvise and creatively respond to uncertainties and gaps in the smooth unfolding of their intended actions (Schön, 1983; Schön, 1987; Suchman, 2003).

- **… stays at the level of describing tools, methods, approaches, and outcomes**. Much research, in this view, stays at the instrumental or functionalist level, making the implicit argument that detailed analysis of tools and methods is enough to bring about desired outcomes, especially those assured by a tool or method's designer or advocate.

- **… does not address the aesthetics and ethics of practitioner choices at the moment-to-moment level**. Much research is neither contextual nor granular enough to adequately characterize the ways professional action always takes place in unique situations. Doing so requires looking at what actually happens in particular situations rather than abstracting to general ones, and looking at specific events in the 'heat' of actual practice – of moment-to-moment interactions and setbacks – in order to reveal what practitioners encounter and overcome.

Research approaches containing these gaps is insufficient to address the dilemmas (or bring about the benefits) they purport to.

#### 1.1.1.1 The experience of participatory representational practice

As will be discussed in more depth in Chapter 9, a desired outcome of this thesis is to contribute to means of assessing, developing, and improving professional practice in domains such as facilitation, mediation, and participatory methods. As such, the research aims to create theory

and methods that can guide practitioner self-reflection by making actions and choices visible and amenable for discussion, analysis, and reflection (Zeiliger et al. 2008; Schön, 1983, 1987; Wagner & Piccoli, 2007). This thesis does so by looking at practitioner competence at a granular level, seeking to describe and characterize situated facilitative competencies and what they consist of (Stewart, 2006). This can only be done by exploring the particular and unique constellations of a person (the participatory representational practitioner), a particular set of "design materials" (the tools, methods, and representational artifacts the practitioner works with), in specific "use contexts" (participatory representation-making sessions) (Udsen & Jørgensen, 2005), taking care to "locate" practitioner actions and subjectivities rather than present them as a reified "master" discourse devoid of particularity (Suchman, 2003; Bardzwell, 2010), or as elements of an abstracted "checklist" of desired behaviors (Wright et al., 2008; Boehner, Sengers, & Warner, 2008).

The participatory representational practitioner experience is taken as the basic unit of analysis – what practitioners encounter, how they act, and what the actions mean in the use situation (Bertelsen & Pold 2004). This thesis aims to extend the concept of "experience" beyond the dualities of user/artifact, designer/user, or designer/participant common in the experience-based design and PD literature (Bertelsen & Pold 2004), into the more "everyday" realm of constructing meaningful representations in meetings. It applies the constructs to a professional domain different to what much of the literature covers (Kaltenbacher, 2008). The experience of facilitating participatory representation-making represents a relatively untrodden domain for HCI (Hochheiser & Lazar, 2007). Practitioner experience is seen at the level of choices and moves, with the intent of examining the constellation of forces at work in a choice and what is at play in that moment, rather than looking just at overall success or rightness of outcomes (Macfarlane, 2002; Wardale, 2008), focusing on what Felsa & Meyera term the "performative level" (1997) – the moment-to-moment moves and choices that practitioners make in the midst of their activities.

The analysis in this thesis focuses on the precursors to specific sensemaking moments (Shaw, 2010) and the "intermediate outcomes" of the actions taken at those moments (Wardale, 2008), attempting to identify as many factors as possible that can reveal what the practitioners were acting on and why. A special focus is on what practitioners encounter at sensemaking moments, characterized by uncertainty, obstacles, doubts, or equivocality (Dervin, 1983; Weick, 1995; Muhren et al., 2008), recognizing that the "risky" and "perilous" nature of the choices made at such moments is accentuated when they are made in full view of participants, with everyone watching (Barrett, 1998).

#### 1.1.1.2 Practitioner responsivity

As a professional practice, participatory representational practice is inherently concerned with questions of ethics – the implications and effects of practitioner actions on the interest and subjectivities of their participants and stakeholders. Thus, this thesis examines the ways that human-human interaction entwines with human-computer as well as human-representation interaction (Creak, 1999) in the studied practice situations, understanding practitioner ethics as always situated (Macfarlane, 2002). It looks at the ethical dimensions of practitioner choices given the situated web of relationships in each session, looking at how the general stance of responsibility to participants and stakeholders plays out on the move-by-move level (Suchman, 2003). It attempts to discern or characterize the "values in action" and locate the practitioner actions within a normative framework (Friedman, 1996; Miller, Friedman, & Jancke, 2007; Aakhus, 2007; Schön, 1983). The research looks for manifestations of practitioner empathy for participants, a key dimension of such ethics (Wright et al., 2008). It pays special attention to the ways the practitioners are responsive to others (Wright & McCarthy, 2008) in the studied sessions, and examines practitioner communication (both verbal and via the representations) in the way it does or does not aid mutual understanding, appreciation of the situation, and empathy (van Vuuren & Elving, 2008).

#### 1.1.1.3 Nature of the constructive practice

This thesis approaches participatory representational practice, in part, as a form of design activity (Schön, 1983) – the construction of visual hypermedia representations – and as such, places considerations of aesthetics and its relationships with the experiential and ethical concepts described above in a central position. The research uses constructs from the arts and humanities (DiSalvo et al., 2009) as a lens focused on practice. As will be described further in Chapter 4, it applies them in both bottom-up (grounded theory) and top-down (normative analysis) ways. Following Taylor & Ladkin (2009), it goes beyond the "tools and outcomes" approach to examine the nexus of aesthetics and ethics in instances of practice (Bødker & Iversen, 2002), and the ways that the aesthetic actions (shaping moves on the representation) themselves reveal ethical "traces" (Leach, 1954). This research examines how the studied practitioners shape the representations, as well as their verbal interventions, in ways that achieve and maintain coherence (Yoong & Gallupe, 2002), bringing out the aesthetic dimensions of their use of the hypermedia technology (Wright et al., 2008). The thesis aims to contribute to strengthening aesthetics as a fundamental concept for HCI (Bertelsen & Pold, 2004) by looking at it as a constructive practice, rather than just as a user's "response" (Kaltenbacher, 2008). It posits one form of an aesthetics-based "ideal model" (Tractinsky, 1997) for participatory representational practice and compares instances of practice to that model. This thesis also aims to make one form of "articulation work" visible and amenable to analysis (Maclean et al., 1990; Okamura et al., 1994; Orlikowski et al., 1995; Schmidt & Bannon, 1992; Suchman, 2003; Bansler & Havn, 2006), illuminating the strategies, dimensions, and challenges encountered by practitioners bridging users with the hypermedia technology across diverse instances and styles. It also provides a set of case studies for how hypermedia artifacts actually get built, on the level of actual practice (Bannon & Kuutti, 1996).

## 1.2 Participatory representational practice

The principal analysis described in this thesis is on a form of professional practice involving helping groups of people create visual representations of issues of importance to them. The analysis focuses on discerning what sorts of challenges, obstacles, and anomalies can occur in the heat of actual practice, and a view of how practitioner skill and experience are involved in keeping the representation valuable to the people involved and the larger effort in which they play a part. It examines instances of participatory representational practice carried out by practitioners of different skill levels and in different contexts. It looks at the moves practitioners make in response to anomalies, the ways they strive to keep a representation coherent, engaging, and useful, and how their shaping of the representation itself connects to the way they are trying to be of service to their participants and to the larger effort.

Participatory representational practice is a form of a broader trend called participatory media, which is concerned with "the skills and knowledge [needed] to function in a hypermediated environment" (Rheingold, 2008: 100). Research in this area includes discussions of the aesthetic, ethical, narrative, and improvisational dimensions of participatory media practices (Rheingold, 2008; Jenkins et al., 2009). As a focus for understanding practitioner experience, such practices are a particularly rich area. Media practices are unique constellations of people, artifacts, and technology. Media practitioners create representational artifacts for specific audiences. Like teachers, attorneys, or performing musicians, they are engaging in a pursuit that can have profound consequences for the people who will interact with those artifacts. However, the sensemaking challenges of media practice take on a different character when the media artifacts are created in real time, with the active participation of people in groups or audiences (Barrett, 1998). Practitioners working with forms of participatory media involve their participants directly in the collaborative creation of media artifacts, such as web pages, newspaper articles, videos, or presentations. The form that the artifacts take, and the ways that participants are involved in the shaping of that form, are directly related, and more visible to an observer than the shaping and involvement that occurs in individual media practice. That is, unlike the individual creation of

media artifacts (for example, a video producer working alone at an editing console), in which most of the choice-making and dialogue occurs silently within the head of the practitioner, the process of shaping of participatory media artifacts can be more easily observed from outside.

### 1.2.1 Participatory knowledge mapping

This thesis focuses on a particular form of participatory media practice, one where many of the threads described above come together, unfolding in sessions that can be recorded and easily analyzed to locate sensemaking moments and practitioner responses. Participatory knowledge mapping (PKM) is a practice using hypermedia software to provide support to groups by constructing graphical representations in real time, a form of *hypermedia discourse* (Buckingham Shum, 2007). Such hypermedia representations do not spring to life fully formed. Their creation and evolution are the product of human engagement, skill, and hard work. Yet, to paraphrase Mark Bernstein's call for "native hypertexts," (Conklin et al., 2001) one may well ask, "where are the accounts of hypermedia practice?" The hypermedia research literature contains few examinations of what it actually takes to foster engagement with hypermedia artifacts, or of the situated work of skilled hypermedia practitioners endeavoring to use the tools and representations to further the aims of a group of people engaged in a collective effort. Little research analyzes the kinds of expertise and artistry this requires to carry out in practice, or the ethical as well as aesthetic considerations that inform such practices.

Many PKM sessions exhibit moments where forward progress is blocked because of unforeseen, uncontrolled, or otherwise problematic obstacles. The sensemaking dimension investigated in this thesis concerns the actions and consequences for what takes place at such moments. They call for creative and skilled responses, since programmed or prescribed responses and rote actions are rarely sufficient. PKM practitioners are concerned with capturing salient aspects of a discussion as it happens as well as with crafting a readable and expressive knowledge map in real time. This requires a host of snap decisions about form and content. The density of decisions they must make is compounded by the fact that the knowledge mapping artifact itself is meant to serve as a

sensemaking aid for the participants – a resource that helps orient them to the ongoing discussion, find connections to previous contributions, and create representations of their problem situation. The practice of constructing hypermedia knowledge maps in such situations requires a considerable confluence of skills. These include the ability to decide how to map each contribution as it occurs, fitting them into the overall structure (which may extend over many individual maps), evolving the structure on the fly, finding relevant previous material, incorporating images and documents from external sources, and keeping the whole coherent and in keeping with the intent of the session.

Compounding these challenges by attempting to construct such representations in groups – with the additional interpersonal issues, group dynamics, and usual issues of trying to get things done in meetings—would seem to be a recipe for failure. And yet, successful practitioners of collaborative hypermedia techniques such as design rationale (DR), issue-based exploration, and argument or dialogue mapping (Conklin, 2005) do exist. A small but growing community of such practitioners[2] has moved well past the "Can it be done?" phase, and these practitioners have successfully applied their approaches in a wide variety of professional, organizational, and research settings. For such practitioners, further improving their practice involves understanding and deepening the skills required. However, little in the research literature addresses such skills and practices directly, let alone is the research advanced enough to use them as the basis for developing a body of principles and guidelines.

To address this gap, this thesis focuses on the particular character of PKM practitioner actions at sensemaking moments. It looks at the ways sensemaking is expressed through, and manifested in, mapping moves, explorations of and changes to the maps, and interactions with participants about them. It also examines the ways knowledge maps and the practitioners' interactions with them contain both a source of obstacles and impasses, and a means of resolving or addressing

[2] See for example http://compendium.open.ac.uk/institute. The associated Yahoo Group has over 1800 members as of this writing (http://tech.groups.yahoo.com/group/compendiuminstitute/).

them. Creating hypermedia representations in collaborative groups requires a set of skills similar to other forms of participatory media practice. Understanding such practices calls for an empirical approach that can illuminate the sociotechnical, as well as aesthetic and ethical, considerations involved in evoking and representing information like plans, ideation, DR, argumentation, and exploratory discussion within groups of people in live meetings. The following set of research questions responds to this call.

### 1.2.2 Compendium

A central aim of this research is to characterize any form of participatory representational practices in experiential terms. Practitioners in the case studies covered in this thesis, however, all used in a particular knowledge mapping software tool called *Compendium*. Originally developed by this researcher at Verizon Communications beginning in 1993[3] to aid in-house business process redesign projects, Compendium's use has since grown into a global open source community. The Compendium approach facilitates the collaborative creation of the content of a knowledge repository, by combining hypermedia, group facilitation techniques, and an analytical methodology rooted in knowledge modeling and structured analysis. It has been applied in hundreds of projects at Verizon, NASA, the Center for Creative Leadership, the Open University, the Corporation for Public Broadcasting, and many other institutions.

Although it can be used in a free-form manner, as did several of the practitioner groups studied later in this thesis, the original Compendium methodology created by its developers comprises three main aspects. The first is modeling facilitation, which guides team members in collaborative construction, elaboration, and validation of knowledge models using a software tool. Facilitators also pay special attention to the capturing and display of informal, or conversational, insights and discussions, and assist team members in linking and managing these ideas. The second aspect is dialog mapping facilitation (Conklin, 2005), which assists groups to surface assumptions and represent design rationale as argumentation. Facilitators also pay attention to group process and

[3] The company was NYNEX Science & Technology at that time, later merged into Verizon.

the emotional climate of sessions, using the modeling approach as part of their toolkit to help surface and bridge communication problems and gaps.

Compendium maps are not 'flat' drawings, but views onto a relational database that can be rendered in multiple formats. A given node (e.g. representing an idea, argument, entity, or document) can appear and be updated in multiple views. Since any application document or URL can be dragged and dropped into a map as a Reference node, an external document can be linked into one or more discussions and tracked – that is, given one or more meaningful contexts where it plays a role. Corrections or updates to a node are immediately updated in every context in which it appears. (Buckingham Shum et al, 2006: 6)

## 1.3 Research questions

Understanding the practitioner experience in participatory representational practice gives rise to the principal question for this thesis:

> *How can the practice of shaping a participatory representation in ways that serve as a focal point for interaction and help achieve group and organization goals, be understood in experiential terms?*

Practitioners engaged in professional practices, such as participatory knowledge mapping, provide a service to their constituents. The service involves both interactions with the participants directly involved in a particular session, as well as consideration of the session's larger goals, which may or may not be directly related to the interests and individual goals of the direct participants. Since they are concerned with making the representational artifacts themselves a key focus for the realization of these goals, considerations of right and expressive form of the representation, and the degree to which participants directly engage with it, are of special interest. This thesis aims to develop and apply methods of illuminating two basic elements of this question: firstly, the choices practitioners make about how to achieve effective shaping, and the moves they make during a session that manifest these choices, especially in moments when forward progress is

challenged or blocked; secondly, how practitioners' choices and moves result in greater or lesser coherence, engagement, and usefulness for the PKM representation.

This question can be decomposed into the following set of related questions:

- ***RQ1: How to characterize and compare the interactions of specific representational situations and practitioner actions?***

  Although there is a great deal of current research addressing questions of "experience" in HCI and related fields, very little focuses on practitioner (as opposed to user or audience) experience, with even less providing methods with which to analyze instances of practice in experiential terms, particularly, not in a manner that explicitly consider the ways practitioners build and modify representational artifacts, such as participatory knowledge maps. This thesis describes the iterative development of a set of methods which can characterize such practice instances in ways that allows them to be compared using experiential criteria.

- ***RQ2: What kinds of obstacles, breaches, discontinuities, and anomalies occur that interfere with a representation's coherence, engagement, or usefulness?***

  The principal focus of sensemaking research is to describe how people respond to challenging or surprising events. Understanding this requires close analysis of the specifics of what makes an event challenging to the people in the situation where it arises. RQ2 addresses the types of sensemaking challenges that can disrupt the practitioner's ability to keep the PKM representation a central and useful focus for the session's participants. This thesis examines instances of practice in order to determine sensemaking triggers, locating them within the narrative framing of specific sessions.

- ***RQ3: How do practitioner actions at sensemaking moments serve to restore coherence, engagement, and usefulness?***

  A central focus for this thesis is on the ways that practitioners respond to the kinds of

sensemaking moments addressed in RQ2. RQ3 looks at practitioner choices and moves in response to sensemaking challenges and at the actions practitioners take to restore coherence, engagement, and usefulness and resume progress towards the session's goals. This thesis examines such actions and their consequences for the session and its participants, characterizing the actions in experiential terms such as aesthetics, improvisation, narrative, and ethics.

- ***RQ4**: What are the specific practices involved in making the hypermedia aspects of the representation coherent, engaging, and useful?*

  The technology involved in any professional practice – the tools that practitioners use – is inseparable from the ways practitioners think about and act within their situations of practice. In the case of the practices examined in this thesis, the fact that they work with hypermedia software to construct hypermedia knowledge maps, is of direct interest. As noted above, there has been little attention in the hypermedia and related research literatures to the situated practice aspects of the technology. RQ4 aims to rectify this by looking closely at the ways the practitioners make use of, and are challenged by, the specifically hypermedia aspects of their tools and methods, as well as the ways they engage with the particularity of this medium (Dewey, 1934) to respond to participant actions and concerns within their situations of practice.

The next section gives an overview of the steps taken to tackle these research questions.

## 1.4 Approach

The research to pursue these questions included development of a theoretical framework that examines the experiential concepts of aesthetics, ethics, sensemaking, improvisation, and narrative in the context of participatory representational practice. It applied the framework to instances of practice observed in a variety of settings and contexts, using a set of iteratively refined research methods. The research was carried out in several steps, following an iterative

qualitative analysis approach (Srivastava & Hopwood, 2009), summarized in Figure 1.1 (and described more fully in section 4.2).

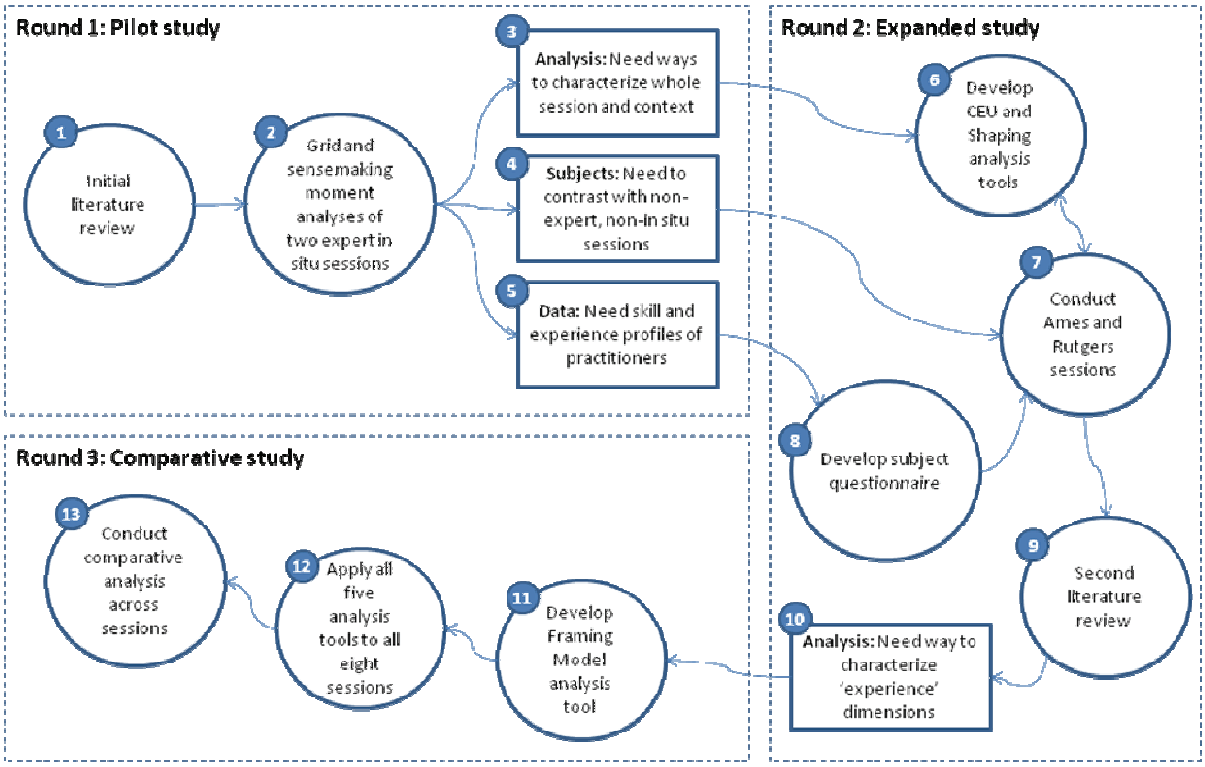



**Figure 1.1: Iterative qualitative approach**

1. The first round conducted close analysis of two *in situ* PKM sessions involving practitioners with high levels of skill and experience during a NASA e-Science project (described in Chapter 4), and developed analytical tools to record and categorize all moves (both verbal and representational) made during the sessions.

2. The second round reflected on the results of the first two analyses and led to the decision to create comparisons with less expert practitioners. Two additional research settings were created at workshops held at NASA Ames and Rutgers University, comprising six additional sessions conducted by practitioners with a wide range of skills and experience. Two additional analysis tools were developed (described in Chapter 4). Each practitioner was also given a questionnaire for self-reporting of their skill and experience levels.

3. Following a further round of reflection, an additional analytical tool was developed. All of the tools were applied to all eight sessions. In all, 14 practitioners were studied and 40 individual session analysis artifacts were prepared. It was then possible to perform comparative analysis of the eight sessions in light of the conceptual framework developed from the literature analysis.

The following three sections briefly introduce the conceptual framework, research settings, and research methods in more detail. Each, in turn, is covered in more depth in Chapters 2, 3 and 4.

### 1.4.1 Conceptual framework

Exploring the aesthetic and ethical dimensions of participatory representational practice draws on a number of theoretical strands. A recent stream of research uses concepts of "experience" to reframe the nature of design and tool use. For example, Wright & McCarthy (2004) propose that an individual's "felt experience," as well as Dewey's (1934) ideas of aesthetics, narrative, and subjectivity, provide a richer and more generative account of design moves and choices than available from cognitivist or social constructionist approaches. Bruner's (1990) narrative theory emphasizes the role of "breaches in the canonicity" of expected events, and the meanings of various kinds of repair attempted by an event's protagonists. Schön's (1983, 1987) work in understanding "reflective practice" in professional situations, particularly his emphasis on the artistry of practice, ties the aesthetic dimension into professional practices. Many research literatures, including mediation (e.g. Bush & Folger, 1994), group facilitation (e.g. Kolb et al., 2008), and group support systems (e.g. Bostrom et al., 1993), address ethical aspects of the practices and technologies involved in working with groups. Researchers connecting aesthetics with facilitative interventions, such as Cohen (1997), Salverson (2001), and Alexander (2010), describe how the aesthetic dimensions of their practices (e.g., participatory creation of artistic artifacts and theater performances) serve, and in some cases undercut, the practices' transformative goals. Drawing on these and others, Chapter 2 outlines a descriptive framework and normative model that can be used to analyze participatory representational practice.

### 1.4.2 Research settings

The primary source data for this thesis were video and screen recordings of practitioners, both experts and relative novices, using the Compendium hypermedia tool in participatory knowledge mapping sessions. The settings were of several types. One type was *in situ* sessions, often several hours long, held as part of larger projects, where the tasks carried out emerged from the highly contextual needs of those projects (such as a NASA remote science team looking at geological data during virtual meetings over a week-long field trial). Another was experiments where teams of mostly novice practitioners planned and carried out a facilitated session for their peers on the theme of space travel.

For both the expert and novice sessions, the analysis focuses on ways choices made by the practitioners in their preparation period (what they were trying to achieve, how they organized the base materials using the software, their intended flow of events, the roles they assigned, the software aspects they intended to leverage) were enacted during the large group sessions, and the aspects of the practitioner experience when they encounter problems or challenges during the live sessions with participants. The settings are described further in Chapter 4.

### 1.4.3 Research methods

As befitting exploratory work in an under-researched domain, this thesis uses qualitative research techniques to identify themes, categories, and dimensions of participatory representational practice. Qualitative approaches, such as grounded theory (Strauss & Corbin, 1990), are generally regarded as appropriate when a field or phenomenon is in its early stages, and when research problems and theoretical issues are not yet well defined. Many of the considerations that the practitioners studied here dealt with were emergent in character, responding to the unexpected events and anomalies that intrude on even the most carefully planned sessions. The analysis effort paid special attention to participant and practitioner verbal statements, practitioner actions, and “moves” on the hypermedia representations themselves (changes made to the representation, such as adding a node or editing label text).

The analysis focused on characterizing the choices made by the studied practitioners in their preparation period (what they were trying to achieve, how they organized the base materials using the software, their intended flow of events, the roles they assigned, the software aspects they intended to leverage) and in their enacting these during group sessions. Using critical incident analysis (Tripp, 1993), moments were selected where practitioners faced some kind of anomaly in the course of a session. Close attention is given to the specific practitioner moves and choices that determined the outcome of sensemaking moments, focusing on the aesthetic, ethical, improvisational, and narrative aspects of those moves and how these contributed to the ways in which participants engaged with the representation, emphasizing the character of the real-time shaping of the representation. Through repeated viewings and application of a number of analytical instruments (described in Chapter 4), the research gave rise to a set of explanatory concepts, categories, and properties, focusing on the engagement of both practitioner and participants with the hypermedia representation. These observational methods were complemented by questionnaires designed to capture salient details of practitioner skill and experience. The questionnaire data created a profile of each practitioner studied, enabling comparisons along multiple dimensions. Findings from both observational and questionnaire data analysis are discussed in Chapters 5 through 8.

## 1.5 Intended audiences

The research described herein is intended to benefit several audiences. The primary audience is researchers interested in ways to compare instances of practice in experiential terms, extending concepts of "experience" current in HCI and CSCW. Researchers interested in sensemaking will find case studies of such behavior applied to a specific form of participatory representational practice, giving the notion of "shaping" (that is, the aesthetics of giving form to representations) more prominence than they often have had in sensemaking research. Hypermedia researchers will find close analysis of participatory hypermedia construction practices, and connections of hypermedia practice to other forms of professional media practices, as well as consideration of concepts like sensemaking, improvisation, and ethics, largely unfamiliar ground for a hypermedia

research. Researchers interested in the nascent field of aesthetic experience of technology will find new case studies of the aesthetic experience aspects of participatory knowledge mapping. Researchers in reflective practice and experiential assessment will find foundational constructs intended to help improve frameworks for professional development. The concepts developed in the thesis should also be of benefit to researchers interested in group support systems, participatory design, facilitation, and mediation.

## 1.6 Thesis structure

The remainder of this thesis is structured as follows:

- Chapter 2 motivates the theoretical framework to be used and maps key research literature into its major categories.
- Chapter 3 surveys related literature in fields such as computing research, studies of professional practice, participatory design, facilitation and mediation, and arts-based organizational interventions.
- Chapter 4 describes the research methods used to examine the eight sessions, how they were identified, the analysis tools developed and their application in iterative qualitative research cycles.
- Chapters 5 through 8 discuss findings and results, considering them in light of the theoretical framework presented in Chapter 2. Chapters 5 through 7 each open with an illustrative example, following a single session from source data through final analysis.
- Chapter 9 concludes the thesis by examining the main contributions of the research to improving understanding of experiential dimensions of participatory media practice and other forms of professional practice. It explores the thesis's strengths, limitations, and open issues, and discusses future applications in areas such as experiential learning and practitioner development.

# 2 Theoretical framework

This chapter extends Chapter 1's conceptual overview by exploring the idea of practitioner experience, the main components of that experience (aesthetics, ethics, narrative, improvisation, and sensemaking). It describes the theoretical framework developed over the course of the research leading to this thesis, followed by discussion of the main components in more depth.

## 2.1 A framework for understanding participatory representational practice

Drawing from Dewey and Bakhtin's ideas about aesthetics, narrative, and subjectivity, McCarthy & Wright (2004) propose that individual experience provides a richer and more generative account of design moves and choices than that available from techno-rational, cognitivist or social constructionist approaches. McCarthy & Wright argue that adopting felt experience as an observational stance reveals aspects of *in situ* human technology use that other approaches miss, such as the situated creativity individuals exhibit in making sense of or personal use of a technology. They look for the potentials inherent in any situation where a person encounters or adopts a tool or methods, such as the room for surprise, how one deals with the opportunistic and unexpected. Using experience as a lens on practice brings to the foreground the "answerable engagement" a practitioner has with the other people in the situation of practice, which has both aesthetic and ethical dimensions. Such an orientation moves the focus of inquiry from objective and instrumental considerations to relational and creative ones. Following this argument, understanding the experience of participatory representational practice requires taking into account a complex constellation of people, tools, representations, surroundings, and other factors. These are summarized in the model shown in Figure 2.1.

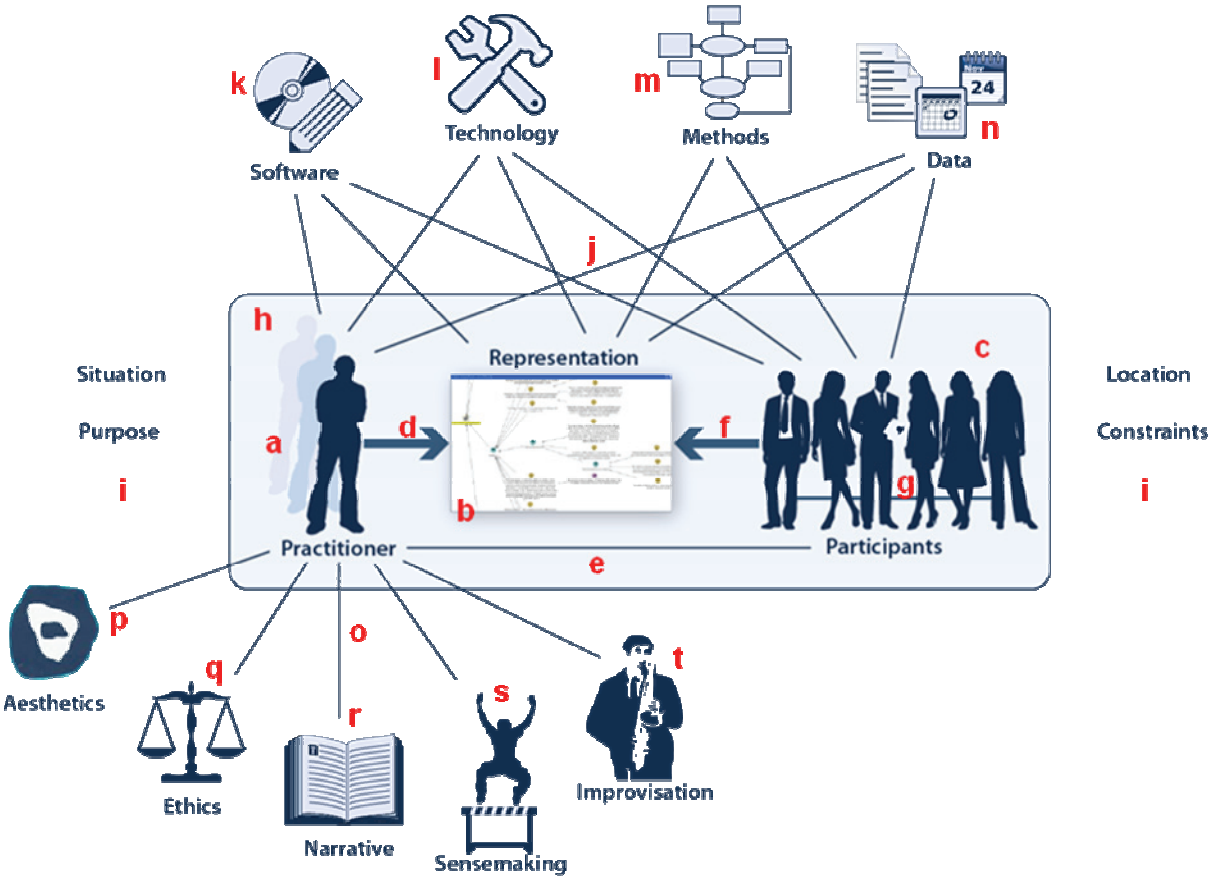



**Figure 2.1: A framework for understanding participatory representational practice**

The primary elements of the model are the people involved in creating the representation, and the representational artifact itself, as seen at the center of the diagram. The practitioner [**a**], who can be more than one person, orchestrates the participatory event and holds him or herself responsible for its success. He or she is concerned with the quality and clarity of the representation and the participants' relationship to it. The practitioner takes primary responsibility for the form and content of the representation and the success of the session within its context [**i**]. Varying levels of intervention can occur. The practitioners are not necessarily the ones with their hands on the equipment; approaches where the participants themselves do the representational work directly are also possible, though the focus here is on practices where a professional acts as an intermediary. The practitioner interacts with the representation [**b**] as well as with the participants [**c**]. The nature of this interaction varies with the context and the specific role(s) that practitioners play in the activity system of the session.

The representation [**b**] can be any sort of visual or textual type of representation, ranging from free-form pictures to formal argument diagrams drawn on an easel sheet to software-based discourse models, such as the hypermedia representations used in the sessions studied in this thesis**.** There can be multiple types of representation used in a session, including notes and action items. The participants [**c**] are the people in the room (whether a real or virtual space) taking part in the session. Being aware of and appropriately dealing with the diversity of participant personalities, relationships, and interests is a key practitioner skill, as well as an ethical imperative. Line [**d**] symbolizes the interaction of practitioners with the representation, which consists of actions on it (such as creating or modifying it), considering it, planning what to do with it, or even ignoring it. As with that of practitioners, participant interaction with the representation is best understood in a situated manner.

Line [**e**] shows the interaction of practitioner with participants. This can take many forms, even in a single session, such as facilitative interventions (keeping matters on track, making sure everyone is heard), questions and discussion, and process checks. It works both ways, as participants also interact with the practitioners in various ways. Line [**f**] is the interaction of the participants with the representation, which ranges from passive to active, from directly engaged with considering it and making changes to it to ignoring it or giving it occasional once-overs. Line [**g**] shows the interactions of participants with each other, from collegial to disputatious to side conversations.

The three primary elements (practitioner, representation, participants) are contained within box [**h**], symbolizing the boundaries of the session itself, such as a specific meeting. Some efforts may consist of a single session, where others comprise many sessions (which may include individual mapping sessions as well as collaborative ones). The session is in turn located within its surrounding context [**i**]. The context includes the overall project in which the representational activity is taking place, the specific locations where sessions are held (including whether they are face to face, virtual, or a combination); the situation that contains the session, such as the project of which the session is a part, the organizations involved, and the problem domain; the purpose of

the session, and the constraints operating in the situation, such as time, budget, attention, or other resource limitations.

The lines [**j**] show the relations between the primary elements and what can be called the set of enablers: software [**k**], technology [**l**], methods [**m**], and data [**n**]. Each enabler is connected to each primary element, because all interact with each. (Note that methods are not connected directly with the representation; methods are always filtered through a person's actions.) Practitioners use the chosen software [**k**] to operate on the representation; there can be multiple software packages in use (or none). Participants may also use the software. The software in turn runs on whatever technology platform [**l**] is in use, such as laptop computers. Technology also includes whatever display tools are being used, such as LCD projectors, virtual meeting or telepresence rooms, and voting keypads (non-computer technology such as flip charts, markers, and whiteboards also count). During sessions, specific methods [**m**] will be employed, whether formal methods such as IBIS argument mapping or data flow diagrams, or informal methods like brainstorming or round-robin discussion. All of these operate on and draw from the data [**n**], that is the subject matter for the session, the conversations and ideas put forth and captured during the session, and any supporting material, such as reference information.

Finally are the dimensions that inform an understanding of practice and the practitioner experience itself. Lines [**o**] show the aesthetics [**p**], ethics [**q**], narrative [**r**], sensemaking [**s**], and improvisation [**t**] associated with the work of the practitioner. Practitioner creativity can be seen in the ways they draw from these dimensions in the moment of action. These are described further in the following section.

## 2.2 Dimensions of participatory representational practice

A techno-rational approach would treat the work of a participatory representational practitioner as simply one of following established protocols, or unnecessary where it is assumed that meetings and participants can take care of themselves. Yet even when there are no so-called facilitators in a meeting, usually someone, however informally, takes on aspects of the role of ensuring that the

meeting reaches its goals. If a knowledge construction task is to be done (as opposed to simply listening to someone else give a presentation), someone will often jump up and take notes on a flipchart or draw a diagram on a whiteboard. As used here, the term *practitioner* includes such informal leaders as well as a paid professional who comes in to run the process and generate the products of a meeting.

In either case, when people act as participatory representational practitioners, they inherently make choices about how to proceed [**q**]; give form to the visual and other representational products [**p**]; help establish meanings, motives, and causality [**r**]; and respond when something breaks the expected flow of events [**s**], often having to invent fresh and creative responses on the spot [**t**]. Choosing these dimensions as a focus for inquiry has both theoretical and methodological implications. As will be discussed below, the five dimensions are found in critical and theoretical accounts of professional practitioner experience, and are under-reported in much of the related work discussed in in Chapter 3. Placing the dimensions in the foreground helped guide the iterative development of the analytical methods described in Chapter 4, such that the analysis could surface means of comparing instances of participatory representational practice along experiential lines. Although they are presented as separate entities here for the purpose of description and analysis, in fact the dimensions commingle in the experience of practice.

The following sections describe each of these dimensions. As aesthetics is most absent from common discourse about technologies like hypermedia for group discussion and participatory representation-making, it is covered first and in the greatest detail.

### 2.2.1 Aesthetics [p]  [4]

All participatory representational approaches have explicit and implicit rules about what constitutes a clear and expressive representation. People conversant with the approaches can

[4] The image of an eye is taken from a Jean Arp woodcut, found on the cover of Arnheim, 1967.

quickly tell whether a particular artifact is a “good” example. This is the province of aesthetics. As implied by Schön’s statement opening Chapter 1, by including aesthetics in an analysis of practice, one may uncover aspects of practice that would be missed using more conventional or techno-rational approaches.

#### 2.2.1.1 Conceptions of aesthetics

Aesthetics has multiple aspects – there is no all-encompassing meaning for the term. As Cohen outlines, the object of aesthetic theory has

> three clusters of concepts – pertaining to (1) the integration of the sensuous and the rational, (2) form and attention to formal qualities, and (3) transformations in the qualities of attention related to non-utilitarian response … related in complex ways. (1997: 177)

Aesthetics has to do with what human beings, in the moments when they are imparting expressive form via some medium (Arnheim, 1967), are actually doing: pulling together aspects of experience into a new whole that itself provides a shaped experience (Dewey, 1934). The aesthetic dimension of participatory representational practice is concerned with the shaping and crafting of representations in response to both immediate and context-specific imperatives (things that must be done to help achieve participant and project goals), as well as to implicit and explicit concepts of right form. Using the lens of aesthetics offers a unique perspective on the relationship of a practitioner to the participants, emphasizing process, collective and participatory expressive forms, even ethical and political concerns (Cohen, 1997). Understanding the aesthetic dimension of a participatory representational practitioner’s work emphasizes how the encounter between participants, representations, and practitioner unfolds, the extent to which representation-building engages participants, and the ways in which participants are affected by the proceedings.

Dewey emphasizes that artistry – whether as a maker or perceiver of artistic objects – requires grounding in both the traditions and history of an artistic practice as well as "motor preparation" (1934: 102), the perceptual and muscle readiness to recognize, comprehend, and appreciate the rightness of an artifact as a work of art. While there is intellectual activity involved, there are also somatic, emotional, and memory dimensions to any act of artistic making or perception. In explicitly incorporating the idea of aesthetics, this thesis follows Dewey's (1934) argument that aesthetics is not an elite, esoteric, or rarefied concept, even though it is treated that way in common usage. Rather, aesthetic experience is to be understood as the high end of a continuum from prosaic experience; it is a paradigm for "true," unalloyed experience. Aesthetics govern how people would experience any situation if the diluting, dulling, oppressive, or conflictual aspects were stripped away (Dewey, 1934; Wright & McCarthy, 2004).

When working with groups, the boundaries of the world of experience are closely aligned with the situation in which they are operating – the people, goals, interests, and constraints of the project or team they are working with. Even within this bounded world, the dimensions and particulars of experience can be vast and diverse, giving rise to the problem – and hence the artfulness – of pulling them together into an "integrated structure of the whole" (Arnheim, 1967: 5).

A commonplace conception of aesthetics has the term refer to ideas of beauty, particularly with regard to fine art. But it has a broader meaning in psychology, philosophy, and evolutionary theory. These conceptions explore the aesthetic aspects of more everyday actions and artifacts. Studies in evolutionary biobehavior have shown that art and art-making have been a prominent feature in every period of human history, stretching back not only for the two to three thousand years commonly thought of as the era of civilization, but in human settlements from more than 100,000 years ago (Dissanayake, 1988). Looking at art-making in this way positions aesthetics as a core human activity and concern, on a par with others such as religion and work, rather than the exclusive domain of highly trained artists operating in an "art world" – a central concern for Dewey (1934) as well.

From this viewpoint, the aesthetic dimension of human activity is that concerned with "making special," the act of giving something extra to everyday activities and artifacts, elevating their importance and significance through various means of making and heightening the sensual and emotional aspects of the artifacts (Dissanayake, 1988: 97-98). Art is thus an "evolutionary means to promote selectively valuable behavior." A phenomenological approach to the experience of making art (Brooks, 2000) moves the emphasis from the perceived aesthetic "value" of an artifact (measured according to rarefied art-world standards) to the lived experience of a person attempting to become aware enough of the character and subtleties of the subject she or he is trying to represent in an artistic medium, as well as how that representation can be accomplished through the tools and media at hand. Drath & Palus (1994) refer to this as "slowing down the looking." In such accounts, the emphasis moves away from the mystique of how to make fine art, to something more immediate and commonplace: "I need to have a wide range of techniques that come to me uncalled. My skill with them must be somewhere outside my immediate awareness. I need to put skill behind me so that I can focus on what is transpiring in front of me" (Brooks, 2000).

In these conceptions, art is no less about skill, but skill is in service to direct encounter with something of immediate importance and significance to the artist/practitioner and their community. It is skill that relies largely on intuition and a "feeling for phenomena and for action" (Schön, 1983: 241). As applied to professional practice of the type that occurs in the context of providing "expert servicing" (Aakhus, 2001) to a project and its stakeholders, an experiential approach goes against conventional understanding of expert skill as an application of prescribed behaviors in set ways. This is a subject of central concern to Schön's account of professional practice:

> Surely they [professionals and educators] are not unaware of the artful ways in which some practitioners deal competently with the indeterminacies and value conflicts of practice. It seems, rather, that they are disturbed because they have no satisfactory way

of describing or accounting for the artful competence which practitioners sometimes reveal in what they do. (1983: 19)

#### 2.2.1.2 Elements of practitioner aesthetic experience

The treatment of artistry and aesthetics in Dewey, Cohen, McCarthy & Wright, Schön, and others extends the idea of experience to the arena of artistic making and the perception of artistic objects, such as what makes an artist an artist, and what distinguishes artistry from other modes of human activity. This includes elements such as making connections, overcoming resistance, aesthetic transcendence, unfinalizability, the particularity of expressive media, and the relationship to audiences and participants.

##### *2.2.1.2.1 Making connections*

For Dewey, central to the idea of artistry is the ability to grasp the connections between disparate ideas, memories, perceptions and sensations and fuse them into a whole. This requires intelligence about, and sensitivity to, the relations between the foci of interest, and an ability to carry out a process of selection and intensification of what is significant. This occurs in a temporal way; art is always a fusing together of the past (tradition, memory, previous work, existing repertoire) with the present (the doing in the moment, current conditions, spontaneity, and novelty) and the future (the reception a work will have, its audience, its expected disposition or use -- what the person is making it *for*) (Dewey, 1934; 74).

The play between past, present, and future extends not only to distant events forward and backward in time, but even in the moments of making and creation:

> The artist is controlled in the process of his work by his grasp of the connection between what he has already done and what he is to do next. . . he has to see each particular connection of doing and undergoing in relation to the whole that he desires to produce. (1934: 47)

Relations between the parts or elements of an artistic object must come together in a whole that possesses an "intuited enveloping quality." The parts will be united in a "resulting sense of totality" that is "commemorative, expectant, insinuating, premonitory" (Dewey, 1934: 200). This sensitivity to, and intelligence about, relations and connections is the cornerstone of the ability to act artistically. The act of taking events from the stream of consciousness and organizing them into some new form "in itself confers an aesthetic quality onto events" (Dewey, 1934: 38).

The imperative for a person acting artistically thus becomes to develop their sensitivity and ability to exploit the nuances of their medium "to the uttermost" (1934: 237). Part of this is the capability to become finely attuned to how, in the particular medium, parts of an overall structure or composition are and should be related to each other and to the composition as a whole. The more attuned an artist is, the more the artist is able to discern what elements and what relations of elements, no matter how minute, are "jarring," and is more able to see what kind of adjustments to the parts and their relations will create a more effective and robust whole. The simultaneous focus on component parts and their relationships to one another, and the ways in which these parts and relationships form the whole in the context of the particular medium, is a centerpiece of Dewey's aesthetics:

> … our most familiar experience – that no whole is significant to us except as it is constituted by parts that are themselves significant apart from the whole to which they belong – that, in short, no significant community can exist save as it is composed of individuals who are significant. (1934: 212)

In this activity, an artist is often guided by, or at least aware of, an inchoate sense of something momentous (1934: 69), something often below consciousness or intellectual grasp, that feels like it is guiding or informing the work. Like McCarthy & Wright, Dewey is here dealing with the "felt experience" of art-making. He is not asserting that any such deep momentous force is actually

operating; rather, he is observing that such feelings and perceptions do form part of what sets artistic experience apart from other sorts.

#### *2.2.1.2.2 Overcoming resistance*

For Dewey, art is a joining together of an emotional "impulsion" to create or express something with the skills and focus to "work over" that something "in terms of a particular medium" (1934: 78). Technical skills or emotions alone are not sufficient. Most, if not all, people have similar sorts of emotions, and one can have technical skills without being an artist. Rather it is these coupled with the drive to overcome the resistances encountered along the path of trying to express or realize the emotional impetus in a particular object created in a particular medium that makes one an artist. Artistry is not inherent; rather it lies in the act of overcoming resistance to focused expression, with the "excitement" and "turmoil" (1934: 64) such overcoming inevitably brings with it.

Dewey holds that the effort required to overcome the "resistance" in a situation is what leads to growth and insight. Without being faced with an obstacle to overcome, growth does not occur:

> The only way [an impulsion] can become aware of its nature and its goal is by obstacles surmounted and means employed… Nor without resistance from surroundings would the self become aware of itself; it would have neither feelings nor interest, neither fear nor hope, neither disappointment nor elation. Mere opposition that completely thwarts creates irritation and rage. But resistance that calls out thought generates curiosity and solicitous care, and when it is overcome and utilized; eventuates in elation. (1934: 62)

Karat et al. define the notion of engagement, closely tied to aesthetic experience, as "total involvement" (2001: 456), especially when concentrated on a defined center of attention (such as a visual representation). Citing Malone (1981), they note that such involvement may need to include an aspect of challenge to sustain engagement.

#### *2.2.1.2.3 Aesthetic transcendence*

McCarthy & Wright, Schön, and others follow Dewey in their emphasis on the aesthetic aspects of experience as a culmination of normal experience, rather than something separate from it:

> The esthetic is no intruder in experience from without, whether by way of idle luxury or transcendent ideality, but that it is the clarified and intensified development of traits that belong to every normally complete experience. (Dewey, 1934: 48)

That is, aesthetic experience represents a heightened state, where meaningfulness and agency (ability to affect) in a situation are paramount, a concept echoed in Csikszentmihalyi's idea of "flow" (1991), which depends on wrestling with challenges and attaining an enhanced level of effectiveness and agency as a result. As such it can be seen as a sort of yardstick by which to measure the depth and nuance of human experience in a situation. At its highest, aesthetic experience brings into focus the many and manifold relationships and connections between past (what we bring to a situation -- expectations, memories, hopes, fears), present (what we perceive, feel, and do in the moment), and future (what sense we will make of it and communicate to others about that experience in the future). Each of these interpenetrate each other -- for example, we often act in certain ways in the present because of something we anticipate rising out of the event in the future. A truly aesthetic experience can lead to a changed sense of self, changed perspective and attitudes, new capabilities and agency. This does not mean that such awareness and dynamism are present or even inherent in every situation, but rather that using the "aesthetic yardstick" can allow us to diagnose what is missing in a situation, a design, or a technology, by looking for what aspects keep the situation and its human experience from rising to that level.

#### *2.2.1.2.4 Unfinalizability*

McCarthy & Wright draw on Bakhtin's literary theory to illustrate the "unfinalizability" of human experience (Bakhtin, 1984). Bakhtin saw the fictional novel (especially what he called the "polyphonic" genre) as the ultimate aesthetic form that emphasizes the multiplicity and openness

of experience -- that with relation to human affairs, no final reckoning or summation can be made. Bakhtin stressed the “dialogicity” inherent in any encounter with others, that the role of “others for me” as well as “I for others” -- both uniquely constituted for every individual -- plays into every human situation. A person's actions and experience cannot be understood except in relation to a particular situation -- that is, actual experience does not occur in the abstract. The depth and nuance of such experience is unfinalizable; its manifold threads tying present experience to past and future cannot be exhausted. Dewey reflects this with his observation that “A lifetime would be too short to reproduce in words a single emotion” (1934: 70).

#### *2.2.1.2.5 The particularity of an expressive medium*

When people act aesthetically, it is always in terms of a particular medium, such as paint, video, music, hypermedia, and so on. Dewey emphasizes the intense relationship of artists as thinking and feeling people to their chosen medium. Artistic expression, as opposed to lesser or mundane types, is not possible without a depth of involvement and close acquaintance of the artist with his or her medium, knowledge of how the medium can be used and has been used in the past (knowledge of the traditions in the use of the medium), and some feeling of necessity attending on the use of the particular medium to make and express, for subject matter to “press itself out in material that changes the latter from crude metal into a refined product” (1934: 68).

The tight bond between artist and medium goes beyond an instrumental choice. For Dewey, “the true artist sees and feels in terms of his medium” (1934: 208) in a manner that goes beyond preconceptions and necessitates the use of that medium for artistic efforts. The artist must clear away anything that might “obstruct and confuse perception” (1934: 208) of what the medium is and can be made to do in the current context. What separates ordinary from artistic use of a medium is in large part the concentration of expression in that single medium, as opposed to diffusing across a range of “channels,” “sources,” and a “mass of material” (1934: 208-209). Focus vs. diffusion, single vs. multiple, pressing impulsion through the resistance that any medium provides to expression, are central characteristics of artistic use of a medium.

#### *2.2.1.2.6 The relationship of aesthetic practitioners to audiences and participants*

Using the lens of aesthetics can offer a unique perspective on the relationship of a participatory representational practitioner to the participants in a situation. The school of feminist aesthetics moves the focus from artifacts created by master artists to an aesthetic that "emphasizes process, elevates collective and participatory expressive forms, and integrates ethical and political concerns" (Cohen, 1997: 171). Thus, according to this view, understanding the artistic dimension of a participatory representational practitioner's work will pay particular attention to how the encounter between participants, artifact, and practitioner unfolds, the extent to which representation-building engages participants, and the ways in which participants are affected by the proceedings as a focus for analysis (both the immediate proceedings, and the relationship of participants to their larger context). Participant concerns, engagement, and acting as practitioners or makers themselves are always to be subjects of concern, and an attitude of commitment to these aspects of practice is expected: "The proper attitude for those involved is one of 'total commitment'" (Cohen, 1997: 221). "Good" practitioners will pay attention to these aspects in the performance of their practice.

### 2.2.1.3 Summary

Aesthetics are an inherent aspect of the work of a participatory representational practitioner. They are especially evident in the seemingly intuitive and creative ways in which a participatory representational practitioner can respond to sudden or problematic situations. Attention to aesthetic aspects may reveal dimensions of practice that more techno-rational or behavioral lenses may miss. Aesthetics can be understood as the selective apprehension and careful, expressive shaping of pieces out of the stream of experience in ways that blend the senses. Aesthetic practice includes physical and emotional as well as intellectual elements. Aesthetics is not a recent development among art-world elites and fine art but rather a core human activity of "making special" that extends back in time to every human culture in every era. A

phenomenological understanding of aesthetics (acts of artistic creation) places attention on the orientation of a practitioner to their representation-making attitude, concerns, and attention in the moment of making. Finally, this conception of practitioner aesthetics has direct relationships to ethical concerns. These will be drawn in more detail in section 2.2.5.2.

### 2.2.2 Narrative [r] 

The narrative dimension concerns the connecting of diverse moments and statements over time, as well as the human experience of causality and consequences. Practitioner actions that have a narrative dimension – that serve to connect elements of the story being built in the representations for later telling and reading by others – contribute to the narrative shaping of both the effort itself and the representations that are the primary focus of their actions. Narrative is both a basic human developmental mechanism independent of any particular embodiment (Murray, 1995) and an aesthetic form that can be represented in oral, written, performed, or other forms. Narrative functions as a key human strategy for exploring and overcoming unexpected turns of events. Stories and story-making form a key psychological strategy for connecting disparate events. This is particularly so when there is a break or disruption from an expected course of events. "The function of the story is to find an intentional state that mitigates or at least makes comprehensible a deviation from a canonical cultural pattern" (Bruner, 1990: 49). Narrative frames human actions and lends explanation to the paradoxes and breaches that one encounters moving through life; in Wright & McCarthy's words, "narrative is a way of knowing that tolerates the existence of paradoxes in the text" (2008: 124).

The skill of the storyteller lies in the artfulness and effectiveness with which he or she can craft an artifact that makes sense of the "breaches in the ordinariness of life" (Bruner, 1990: 95). Narrative is a central means by which people are able to glue together bits of experience to construct a new understanding. It is also a key part of human development, a way that we learn to construct and

communicate understanding of events and environments. Narrative is a central mechanism to confront surprise and the confounding of expectations:

> The perpetual construction and reconstruction of the past provide precisely the forms of canonicity that permit us to recognize when a breach has occurred and how it might be interpreted. (Bruner, 1990)

Further, narrative is an intentional form – things that are created, with varying degrees of skill, to serve various purposes. Stories explain the breaches in the ordinariness of life and put them into understandable contexts. Stories do not inhere in "reality," they are always creative constructions, sequences of events woven into what appears to be whole cloth, in the service of explicating some exception to the mundane. Descriptions of the mundane in and of themselves are not stories, unless they rise to include some breach and its consequences.

Bruner termed people's ability to create meaning from events an "astonishing narrative gift" (1990: 96) that people use every day without intending or realizing it. Narrative enables coherence to be drawn and communicated in even the smallest interactions, even (perhaps especially) in one's communication with oneself, making sense of the events of a day and drawing them into some sort of acceptable ("mitigating," in Bruner's term) comprehensibility. Payne (2006: 27) cites Polkinghorne (1988: 11) in describing narrative meaning as the way people "give form to the understanding of a purpose to life" and asserts that it is "the primary scheme by means of which human existence is rendered meaningful." As discussed above with regard to aesthetics, a central focus for narrative is the human ability to discern and create connections between what our senses and "brain structures" perceive as a "rudimentary experience of objects and activities." As Polkinghorne (1988: 1) puts it, "the actions of the realm of meaning add to this awareness an additional presence of relationships and connections among these rudimentary perceptions," including relationships of similarity, sameness, instantiation, standing for, distinctions of part and whole, figure and ground, and causality.

McCarthy & Wright (2004) point out that, as individuals, our interactions with technology can be understood through the prism of roles like author, character, protagonist, and co-producer. People are always actively engaging with technology as individuals who have their own aims, history, emotions, and creativity, as much as they are also embedded in a socio-historical context or attempting to perform some kind of task or composite activity. Theorists see narrative as both a developmental and a sociocultural construct.

#### 2.2.2.1 Narrative as a developmental construct

Narrative theorists describe it as a basic human psychological mechanism active in all cultures and starting from babyhood. Narrative inheres in our every attempt to explain ourselves to one another, or even in our own self-telling to make sense of events. Bruner describes children in their cribs telling themselves "stories" about what happens in their day-to-day lives. Each such telling constitutes a selection, shaping, and sequencing of thoughts and events (Bruner, 1990; Murray, 1995).

Bruner (1990) cites studies of small children beginning to select memories (if very recent) and experiences and put them together in sequences with explanatory glosses – this is why this happened, this is what happened next. These early stories find expression in crib talk (two-year-olds singing stories to themselves of what happened that day and what is going to happen in the day to come) as well as the explanations and excuses they offer to their parents and siblings about things they have done.

#### 2.2.2.2 Narrative as a sociocultural construct

Bruner (1990) describes how exception-explaining mechanisms arise in each of us whenever we witness something that transpires outside the realm of normal expectation. He gives as an example someone marching into a post office waving a flag, disrupting the lines of people placidly displaying normal "post office" behavior. Each person would, even in his or her own mind, construct an explanation for the flag-waver that locates the behavior in some framework, such as "it must be a holiday" or "obviously the person is crazy." These inventions, these "this happened

then that happened because of this reason," are stories. The form these stories take is itself governed by cultural norms and expectations (Rosenwald & Ochberg, 1992).

People go through life acting within these standards, explaining their own actions and those of others according to definitions of what fits and what does not largely, or mostly, unconsciously absorbed from the cultural ether surrounding us. A culture could be said to be characterized by the interplay of its "connecting stories," even if they diverge in meaning, intent, or implications (Bruner, 1990). At the same time, Rosenwald & Ochberg call attention to the ways in which culturally imposed narratives limit the possibilities of developing more nuanced understanding of one's situation:

> Most narratologists ... assume that the explanations individuals offer of their lives are inevitably shaped by the prevailing norms of discourse within which they operate... social influence shapes not only public action but also private self-understanding… the alternatives one recognizes as possible or moral are constrained in the marrow of individual self-representation. Those strictures in turn limit personal and political emancipation. (1992: 5)

Narrative is a central way by which people communicate with each other in order to make sense of events. As Johansson & Heide put it: "When people tell stories about their experience they do not simply repeat or duplicate stories. Rather, it is a conscious or unconscious filtering and sorting with the aim to make their life and experience meaningful and understandable." (2008: 295)

#### 2.2.2.3 Narrative as a practitioner stance

While acknowledging that narrative provides an enveloping sociocultural frame for a participatory representational practitioner's work, this thesis focuses on the more active and intentional stances and techniques that practitioners can take in service of the instrumental goals of the participants and themselves. Narrative is employed as an intentional strategy in a variety of professional practices. Among these are techniques such as narrative therapy, in which

practitioners help their clients construct new life stories in order to come to fresh understanding of their agency, experiences, and possible new actions (Bruner, 1990; Murray, 1995; Payne, 2006). Narrative is used as a mediation strategy in dispute and conflict resolution settings. Understanding the ways narrative is used in these contexts helps shed light on the ways participatory representational practitioners weave various narrative strands and use intentional narrative techniques in their work, as well as providing a frame for understanding the practitioners' efforts to maintain the coherence and integrity of the hypertext representation even in the face of interruptions and potential derailments of their sessions (Yoong & Gallupe, 2002). Narrative also lies at the core of hypermedia representations, providing associations between disparate elements in the service of various themes and adding the dimension of temporality. Narrative itself is uniquely hypertextual – a gluing together of moments in time accomplished in a visual medium, stressing associations and relationships; and the narrative quality of practitioner moves is manifested in their manipulations of nodes, links, and transclusions, providing explanations and supplementing earlier points, as well as creating structures that will be of use for future "readings" and "writings".

For some theorists, narratives follow a particular trajectory. On the level of the experience of both "writing" and "reading" a narrative, Alvarez & Merchan (1992) trace Ricoeur's "mimesis" process in three phases: prefiguration (the "mute experience of life, without meaning as yet, shared by every human being; the very stream of life"); configuration (shaping of that experience by the acquisition of meaning given by the author), and refiguration (the reader "developing a new grasp of reality that may change his or her acting"). The same trajectory could be applied to the collaborative writing and reading of a knowledge representation. Moving from the prefiguration state of the group of participants (and practitioner) involved, where meanings are held in unquestioned (or undeveloped), mute state; to the configuration state in which practitioner and participants, from their separate vantage points, shape their experience into the representation; to the refiguration state where new meaning and consequent actions arise (and so on in a continuing cycle of configuration and refiguration).

In their study of communication processes in organizational change, Johansson & Heide describe how different people within an organization experience change in sometimes competing narratives and interpretations: (2008: 295). Narrative provides a way of understanding the "unpredictable and non-linear" situations that occur during periods of organizational change. People unconsciously employ narrative to give meaning to the events, an action which is a result of people's "understanding and sensemaking processes." (2008: 294)

Narrative analysis provides a frame for understanding practitioner efforts to maintain the coherence of representations even in the face of interruptions and potential derailments within sessions. For example, what is the intended arc of events? How is that arc meaningful to the participants? What roles do the various parties play and how are those important within the surrounding situation? As well as looking at this encompassing framing, this thesis also looks at the ways breaches of the expected occur, and how the practitioner as protagonist reacts to these. It also examines the narrative aspects of the participatory representation themselves and how changes to representations relate to the other narrative levels at play in and around a session.

### 2.2.3 Sensemaking [s]

The previous section described how narrative theory emphasizes the human experience of encountering breaches in expectation and causality. Narrative understanding is an important source for sensemaking processes (Johansson & Heide, 2008). Sensemaking theory examines what happens at the moment of encounter with a breach. Researchers from a variety of fields are increasingly attempting to understand what occurs when people encounter situations characterized by instability, unpredictability, overload, and other factors that prevent, even temporarily, smooth and predictable progressions of stimulus and action.

Several definitions of sensemaking appear in the literature. Some researchers treat sensemaking as largely in the province of information retrieval: there is a problem or question, a body of

information that relates to it that one has acquired (or has been thrust into) through some means, and there is a need to develop an understanding of it (Russell et al., 1993; Klein et al., 2006). Such research, which largely focuses on tools and people as users of those tools, has a tendency to treat the human dimensions of sensemaking in a somewhat uniform, or even mechanistic manner. Given certain types of situations and certain types of tools, people are seen to respond and behave in certain ways that can be more or less aided by different sorts of a priori approaches. Another, only partially related, vein of sensemaking research is more generally a qualitative or phenomenological approach. This has more to do with the human experience of being brought up against a discontinuity of some kind, something that prevents a person from moving forward as they want or need to do. This conception is identified in large part with Brenda Dervin (1983, 1992, 1997, 1998; Dervin & Naumer, 2009) but also related to the broader organizational sensemaking described by Karl Weick (1995; Weick et al., 2005; Weick & Meader, 1993), in which the ways in which people in groups and organizations encounter disasters and catastrophes play a large role.

Dervin's model posits that sensemaking occurs when an obstacle (a "gap" in Dervin's terminology) stops or frustrates a person in their progress through "time-space" and stymies their efforts to continue. In order to resume progress, the person needs to design a movement (a bridge) around, through, over, or away from the obstacle. This can be as simple as asking someone for directions or help, or as complicated as a set of actions that may have a trial-and-error character. "As an individual moves through an experience, each moment is potentially a sense-making[5] moment. The essence of that sense-making moment is assumed to be addressed by focusing on how the actor defined and dealt with the situation, the gap, the bridge, and the continuation of the journey after crossing the bridge" (Dervin, 1992: 69-70). These sensemaking actions can be

[5] Dervin uses the term "sense-making" rather than the more common "sensemaking." From personal correspondence (2011): Dervin "purposively uses the hyphen to mark sense-makings as verbings. Dervin's "Sense-Making" is a methodology for studying internal and external behaviors she labels as sense-making, sense-unmaking. She includes in sense-makings and sense-unmakings (phenomena) all the verbings humans do in internal; and external communicatings, individually and collectively. Information processing and all its variations; as well as knowledge-making and all its variations are among these."

understood as attempting to answer a set of tacit questions: What is stopping me? What can I do about it? Where can I look for assistance in choosing and taking an action? Weick & Meader (1993: 232) define sensemaking as the process of constructing "moderately consensual definitions that cohere long enough for people to be able to infer some idea of what they have, what they want, why they can't get it, and why it may not be worth getting in the first place."

Although in some ways sensemaking can be thought of as a perpetual, ongoing process (Weick, 1995), it is also something placed in sharp relief by encountering surprise, interruption, or "whenever an expectation is disconfirmed" (Weick, 1995: 14). Schön characterizes such moments in professional practice as situations of "complexity, instability, and uncertainty," laden with "indeterminacies and value conflicts" (1987: 19). Such moments are further defined by a "density of decision points" (Sawyer, 2003: 145). In professional practice, the moments where sensemaking comes to the fore can have the character of impasses (Aakhus, 2003) or dilemmatic situations (Tracy, 1989; see also Aakhus, 2001).

Sensemaking moments are not of any inherent length. Schön refers to the time-scale of such moments as the "action-present":

> … the zone of time in which action can still make a difference to the situation. The action-present may stretch over minutes, hours, days, or even weeks or months, depending on the pace of activity and the situational boundaries that are characteristic of the practice. (1983: 62)

Schön's conception of reflection-in-action "hinges on the experience of surprise"; an expert professional is able to respond to this with an artful, sophisticated exploration of the "understanding which he surfaces, criticizes, restructures and embodies in further action." (1983: 50) The professional engages in a "conversation with the situation." Aakhus characterizes this as a "design" activity (2003). There is also an aesthetic dimension, which Cohen finds in Peirce's epistemological concept of "abduction": "Abduction functions in 'ordinary' perception, as when

the mind struggles to get a grasp on a scene, and finally, as in a flash, the connection and harmony become apparent" (Cohen, 1997: 186).

Representation-making, whether physical or mental, is central to sensemaking responses. Russell et al. (1993) point out that "representation design is central to the sensemaking enterprise" and, when engagement occurs in a "learning loop" of refining representations, this can "reduce the cost of task operations, changing the sensemaking cost and gain structures." Creating representations is in itself often a way to help negotiate and construct a shared understanding (Weick & Meader, 1993) of a situation or project as a whole. Within this larger frame, the act of representation itself engenders both negotiation and confusion, when the tools and discourse lose, if even momentarily, a clear sense of fit. This thesis looks at the particular character of participatory representational practitioner sensemaking, especially as it is expressed through moves on the representations, explorations of and changes to them, and interactions with participants about them (Selvin & Buckingham Shum, 2008, 2009). It considers in what ways representations, and the practitioners' interactions with them, contain both a source of obstacles and impasses, and a means of resolving or addressing them.

This requires consideration of how people determine meaning and orientation in the face of uncertainty, especially when there are multiple or competing perspectives on what is going on, coupled with pressure and constraints on resources that might help make sense of an equivocal situation (Muhren et al., 2008). Applications of sensemaking research include work on creating better tools and representations to aid individual sensemakers in the context of information retrieval (Russell et al. 1993), naturalistic decision-making (Klein et al., 2006), organizational communication (Weick, 1995; Johansson & Heide, 2008), audience and user studies (Dervin & Naumer, 2009), the role of artifacts in organizational knowledge (Shariq, 1998), and management (Kurtz & Snowden, 2003).

#### 2.2.3.1 Summary

The actions of a skilled practitioner at sensemaking moments, moments of uncertainty and complexity, characterized by surprise and interruption and the confounding of expectations, differ from those of a novice or less skilled actor in the depth and quality of the reflection-in-action, aesthetic engagement, and rapidity of effective response. The moments can extend in physical time. Focusing on the actions of a participatory representational practitioner may illuminate both the nature of skilled practice in this medium and lay out directions and options for future research and professional development.

### 2.2.4 Improvisation [t]

While some aspects of participatory representational practice follow predetermined patterns and draw on techniques and methods planned in advance, skilled practitioners often find themselves switching to alternative sensemaking strategies, or even improvising. It is the degree of creativity employed at this point that distinguishes the *improvisational* dimension of action from other sorts of sensemaking activities. Improvisation can be discerned in the freshness and innovativeness of the response to an event that triggers sensemaking.

Improvisation is rarely a focus for research in the HCI, CSCW, hypermedia, and group support systems (GSS) fields. Even in fields like teaching or semiotics, despite their focus on the highly improvisational world of human speech, studies of improvisational aspects are relatively few and far between (Sawyer, 1996). Improvisation is difficult to control for or measure in laboratory or outcome-based studies of software tool use. Some research into meeting behavior, such as the use of GSS technologies, tends to regularize the practices surrounding the technology (Aakhus, 2001, 2004), analogous to similar moves to “script” teacher-student interactions (Sawyer, 2004) and otherwise de-skill or de-emphasize the creative aspects of many sorts of professional practices (Schön, 1983). Yet improvisation is not just a metaphor for what occurs in the

encounter of participants, practitioners, context and tool use; rather, improvisation is core to a grounded theory of situated social action (Sawyer, 1997) for such encounters.

Sawyer (1999) discerns three levels at which to understand improvisation: individual (improvisation on the part of particular actors), group (improvised interactions within a bounded, particular situation), and cultural ("the pre-existing structures available to performers — these often emerge over historical time, from broader cultural processes"; 1999: 202). The cultural level supplies the elements of a practitioner's repertoire (Schön, 1983), the collection of preexisting techniques and concepts (whether learned in school or from work or other experiences), which Schön terms the "scope of choice" containing what the practitioner draws from, combines, and invokes in the heat of an encounter. Practitioners of exceptional skill often possess repertoires of great range and variety (Schön, 1983), which they are capable of combining in innovative, expressive, and subtle ways.

Maintaining an awareness of the emergent aspects of a situation, however, does not mean that all is left to chance. Sawyer (2004: 12) emphasizes the concept of "disciplined improvisation," which juxtaposes improvisational aspects of practice (dialogue, sensemaking responses, spontaneous and creative acts) with "overall task and participation structures," such as "scripts, scaffolds, and activity formats." Skilled practitioners are able to navigate judiciously between moments when they can rely on pre-existing structure and scripted actions, and moments calling for fresh responses and combinations. In a participatory representational session, improvisation can take many forms, such as sudden shifts in stance or tool strategy. Often these are mini-improvisations that occur and conclude rapidly, unplanned and not referred to verbally in the course of other sorts of actions.

#### 2.2.4.1 Improvisational skill

Degrees or levels of mastery can be observed in different practitioners. Furnham (2003) cites Frost & Yarrow's (1990) use of the term "disponsibilite" as a capacity of availability, openness, readiness, and acceptance; "the condition improvisers aspire to … having at one's fingertips the capacity to do or say what's appropriate." This distinguishes what could be called "intentional"

improvisation – that entered into intentionally as a part of a known practice – from the inherent improvisation that all people do as part of everyday actions like verbal conversation. Expert improvisers are able to marshal the bits of routines, motifs, structures, and frameworks they have learned (Sawyer, 2004) and assembled from experience and immersion in their medium. Beginners or apprentices will have neither this broad repertoire to choose from nor the experience to know what combinations might work in various situations (Sawyer, 1999). This only comes from having the ability to "devote the sustained attention to internalizing an improvisational tradition."

Schön (1983) illustrates this in his description of the mastery displayed by jazz drummers. They exhibit a "feel for the material," making "on the spot judgments" about how to read the schema at work and choose from their "repertoire of musical figures." The elements get "varied, combined, and recombined" to "give coherence to the performance." As the musicians around them make shifts in direction, each player "feels" the new direction, makes "new sense of it," and adjusts accordingly. To get to this point of expertise requires years of perfecting technique and building up a variety of elements to draw from, and the sensitivity to know which kinds of contributions will add to the whole, support the other players, and be fresh and authentic, not rote.

In the absence of a structured or pre-scripted template for managing (at times fraught) conversational interactions, practitioners must themselves improvise the scope, nature, and tempo (frequency and depth) of their regulation of or intervening in the participants' discursive flux and flow. Beyond this regulatory role, they also need (if it is situationally appropriate) to "notice and comment on connections" (Sawyer, 2004: 15) between participants and with the content. This requires the ability to maintain "coherence with the current state of the interactional frame" (Sawyer, 1997) as well as looking for opportunities to contribute their own insights on items of relevance or points of connection in the discourse or surrounding context.

#### 2.2.4.2 Improvisation and practice

Studying the role of improvisation in skilled professional practice requires an emphasis on the character of practitioner actions in the face of difficult, unusual, or complex situations. Differentiating the expert from the novice, Schön argues, is the expert's ability to act effectively when being spontaneous without having to (or being able to) plan their actions in advance – acting with a rapidity and spontaneity that "confounds" the less skilled (Schön, 1983). The "artful competence" that expert practitioners can display inheres in just this ability to respond to a situation's complexity "in what seems like a simple, spontaneous way" (Schön, 1983), often drawing from elements only available in the immediate surroundings. For Nachmnanovitch (1990), this shows the expert improviser as a *bricoleur*, an "artist of limits," taking bits of the situation, combining them with their repertoire of readymades, and creating something of unique relevance to the needs of the situation.

A key property of improvisation in a situation is its emergent character -- situations or moments where the outcome "cannot be predicted in advance" and the actors do not know the meanings of their actions until others respond. (Sawyer, 2004; Aakhus, 2003: 284). For situations like participatory representational practice, this can be further characterized as collaborative emergence, in the sense that "no single participant can control what emerges; the outcome is collectively determined by all participants" (Sawyer, 2004). In the realms of facilitation and mediation, where there is a practitioner helping a group of people (whose interests may be divergent) work together towards some common purpose, holding an orientation towards the situation's emergent character is an important ethical stance. Mediators' intentions themselves should be emergent, based on the discovery of the actual (and often shifting) nature of the situation (Aakhus, 2003).

#### 2.2.4.3 Summary

The dimension of improvisation describes how practitioners deal with unexpected events in the course of a participatory representational session. Although improvisation is rarely a focus for

research in the HCI, CSCW, hypermedia, and GSS fields, there is a broad literature that examines the role and nature of improvisation in a number of fields. Skilled improvisers draw on "repertoires" and "readymades," and have a broader scope of choice than those with less skill. Improvisation has its own ethical implications in various practices, as will be explored further in the following section.

### 2.2.5 Ethics [q] 

> Professional ethics is concerned with the values appropriate to certain kinds of occupational activity… which have been defined traditionally in terms of a body of knowledge and an ideal of service to the community; and in which individual professionals have a high degree of autonomy in their practice. (Chadwick, 1998)

For participatory representational practice, the ethical dimension is concerned with the responsibilities of the practitioner to the other people involved in their situation of practice and with those people's various individual and collective needs, interests, goals, and sensibilities. In some situations, these responsibilities can be weighty in nature—for example, in situations of conflict or dispute, where every action and statement on the part of participants or practitioner holds the possibility of worsening the situation. In less fraught settings, consequences of action or inaction may be less severe, but can still have effects on the concerns of the participants or other stakeholders. Of particular concern to this thesis are practitioner actions that affect the engagement of participants with each other, with the subject matter of their work, and with the nature and shaping of the representations. These often can take the form of questions: Should I do action *x* or action *y*? What effect will it have on these participants if I do *x*? Should I intervene in their conversational flow? or Should I expend the effort to capture everything that person A is saying at this moment, or is the time better spent in cleaning up the map or preparing for the next activity?

Decisions about such actions often need to happen with extreme rapidity in a participatory representational practice context. In the heat of the moment, there is not time to hunker down and weigh the possible ethical effects of actions one might take. This does not lessen the fact that such choices are indeed ethical ones. The choices made reflect an a priori set of ethical concerns, and they have ethical consequences.

Of special concern for this thesis are treatments of how aesthetics meets ethics in professional practice, such as the need for aesthetic practitioners to be reflective about their practice (Salverson, 2001; Ellis, 2003; Hansen et al., 2007); and the need to balance a practitioner's aesthetic or personal goals with those of participants, clients, communities, audiences, co-workers, and other stakeholders (Alexander, 2010; DiSalvo et al., 2009; Sawyer, 1996; Sawyer, 2001; Dowmunt, 2003; Hansen et al., 2007; Small, 2009; Osthoff, 1997).

#### 2.2.5.1 The scope of practitioner ethics

Ethics in professional practices are unavoidable. Goffman (1967, quoted in Aakhus, 2001) points out that any expert servicing involved in "handling the problems of a client" involves "moral underpinnings." Practitioners are constantly making choices about what actions to take, whether they do so consciously and intentionally or not, and these choices have consequences and effects for their clients, participants, and other stakeholders.

Practitioner ethics occur in particular situations at the intersection of the practice (methods, techniques, and tools), participants, representational artifact(s), and the practitioner him or herself (see Figure 2.2).

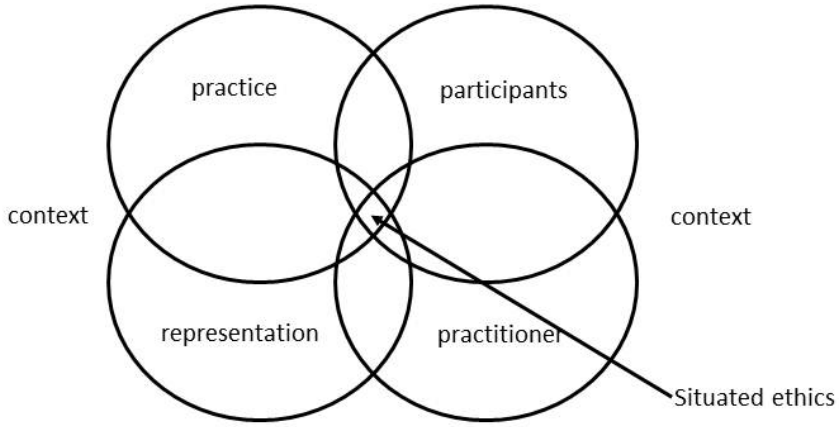



**Figure 2.2: Location of situated ethics in practice context**

Each combination of these at specific moments is unique, however strong the similarities are to other situations in the practitioner's experience. It is the ethics of the actions at these moments – especially when they face "normative dilemmas" (Aakhus, 2001: 342) where practitioners must choose right actions without violating the boundaries of their roles – that are of interest. In the spirit of the ethical dimension of Schön's reflection in action, Aakhus uses the phrase "normative reflection" to describe the development of an ethical sense on the part of practitioners: "The use of principles to invent reasons that resolve problems in a particular way, make trade-offs on competing goals, and the choice of particular techniques." By doing so he puts the responsibility for making choices (and engaging in normative reflection) on the shoulders of the practitioners themselves, as individuals but also as a community (Aakhus 2001), rather than on extrinsic artifacts like codes of ethics.

Simplistic conceptions of practitioner ethics (i.e. those that place emphasis on the techniques and tools rather than the active choice-making of practitioners) obscure the nature of practice in these situations and possibly limit the effectiveness of practitioners who subscribe to them. As ethnographic observations of other sorts of expert professional practice have shown (Levina, 2001; Dreir, 1993), characterizing the intersection of practitioners and clients as a group of disinterested actors pursuing a single unitary goal is an oversimplification. Rather, actors in problematic organizational situations always approach it and each other with a set of partially

overlapping interests, goals, relationships, and concerns. In a theme that will be explored in more depth in section 3.4, Aakhus (2001: 362) argues that "neutrality" is not an adequate ethical self-conception for practitioners like dispute mediators to hold: "The rationale dispute mediators commonly use to explain their neutrality frustrates practitioners, stifles innovation for individuals and the profession, and obscures political dimensions of practice."

#### 2.2.5.2 A normative model for participatory representational practice

This section provides a model for how the concepts discussed above can inform consideration of participatory representational practice in a context of service to others. It describes how the practice and context interweave, and how the role of artistry and aesthetics can be understood in that connection, highlighting the ways that the aesthetic and ethical dimensions of such practice intertwine (McCarthy & Wright, 2004: 67).

Aesthetic experience can be used as the basis for a normative or ideal model up against which to hold situations of practice (Aakhus, 2007; Aakhus & Jackson, 2004). Such a model could be used as a diagnostic tool to analyze what factors are preventing a situation from achieving its aesthetic potential, or at least, to characterize a practice situation in potentially useful ways.

The model presented in Table 2.1 summarizes the concepts described in this chapter thus far in terms most salient to an experiential understanding of participatory representational practice, particularly where the aesthetic, narrative, sensemaking, and improvisational dimensions meet situated ethics. It describes how to use the dimensions explored in this section to think about a practitioner using a medium to help a group create and share meaning through one or more representations, in the context of expert servicing. The model provides a set of components, elements, and exploratory questions to help determine how in the context of service, the unique set of people, goals, constraints, situation, and subject matter, can inform the "shaping" the practitioner performs on the representational object(s), and vice versa. Understanding and characterizing this has both normative (notions of what practice in such settings should be) and

descriptive (how do we look at and characterize situated practice in service) aspects (Aakhus & Jackson, 2004).

Table 2.1 contains three columns. The first (leftmost) column shows the major categories or components of practitioner "stance" – their orientation to various aspects of the situation or practice setting. There are three major components of stance – the practitioners' stance towards themselves and their own actions; their stance towards the participants; and their stance towards the situation as a whole. The middle column breaks down each stance into "elements," which in turn generate possible descriptive (characterizing) or normative (evaluating) questions that can help guide analysis of a particular setting, found in the rightmost column.

Following the table are further descriptions of each element.

**Table 2.1: A normative model for participatory representational practice**

| Component of stance | Element | Descriptive and normative questions |
|---|---|---|
| (A) Towards the practitioner's own involvement (self in situation) | (A.1) Imposing one's own coherence and values on a situation | • What coherence is the practitioner imposing on the situation?<br>• What values is the practitioner imposing on the situation?<br>• In what ways are these congruent (or not) with those of the participants? |
| | (A.2) Constructing narratives to account for how the situation arrived at the current pass; causes and breaches in canonicity | • What is the narrative the practitioner is using to construct the situation?<br>• What is its degree of internal consistency?<br>• How evocative and inclusive is it?<br>• How useful is it? |
| | (A.3) Minimizing the effects of prejudices, preconceptions, and personal desires in one's work | • What prejudices may be active?<br>• What preconceptions may be active?<br>• What personal desires or goals may be active? |
| | (A.4) Personal authenticity in the practice setting | • In what ways is the practitioner acting in an authentic manner (vs. received, affected, etc.)? |
| | (A.5) Mediated objects and other interventions that preserve openness and dialogicity | • How do the representations the practitioner constructs or modifies foster openness and dialogicity?<br>• How do they inhibit them? |
| | (A.6) Artifacts that are clear, expressive, and helpful | • How clear are the artifacts produced or modified by the practitioner?<br>• How expressive are they?<br>• How helpful are they within the context of practice? |
| | (A.7) Perseverance in the face of checks and resistance | • What checks to forward progress does the practitioner encounter?<br>• What resistance from participants, materials, etc. occurs?<br>• How does the practitioner respond in the face of these? |
| | (A.8) Clear and focused communication | • How clear is the practitioner's verbal communication?<br>• In what ways does the practitioner maintain focus on the aspects of importance in the situation? |

| Component of stance | Element | Descriptive and normative questions |
|---|---|---|
| (B) Towards the other people involved (participants) | (B.1) The importance of participants' personal impulses and desires; attention to what may be bothering or affecting participants | • What observable or discoverable participant impulses, desires, or other factors are operating in the situation?<br>• How does the practitioner address these? |
| | (B.2) Unfinalizability; preserving room for surprise, imagination, and creativity to emerge | • In what ways do the practitioner's actions reflect an attitude of unfinalizability toward the participants and their interests, concerns, and agency?<br>• In what ways does the practitioner preserve or close off room for surprise, imagination, and creativity to emerge? |
| | (B.3) Dialogic orientation | • How do the practitioner's actions and communication open up or close off dialogue in the situation?<br>• In what ways does the practitioner display openness and sensitivity to the different participant voices (vs. summarizing them into abstractions or types)? |
| (C) Towards the event or experience as a whole | (C.1) Heightened degree of connection between people, setting, purpose, and medium | • How do the practitioner's actions help create this kind of connection and integration?<br>• In what ways are the distinctions or boundaries between people, setting, objects, etc. made stronger or weaker? |
| | (C.2) High level and quality of communication | • How does the practitioner elevate (or diminish) the level and quality of communication in the practice setting? |
| | (C.3) Importance of the past as the background and context to the practice setting | • In what ways does the practitioner refer to or bring in elements of past work, ideas, or events?<br>• Are such “background” elements combined with “foreground” (current) concerns, ideas, or representations? |
| | (C.4) The relationships of parts to parts and to the whole | • How does the practitioner focus on both individual details and the relationships of those details to the 'big picture' and each other?<br>• How are the moves from parts to whole accomplished? |

#### 2.2.5.3 Component A: Towards the practitioner's own involvement (self in situation)

**Element A.1**: Schön discusses how practitioners in any professional setting inevitably impose their own coherence and values on a situation -- indeed, they must do so to be effective (1987: 158). The choice of the word “impose” is telling. Practitioners should be aware that the same actions and thought processes that enable them to make sense of a situation and adapt their actions accordingly also imposes a frame of references and assumptions that may or may not be congruent with those of the participants.

**Element A.2**: Practitioners must construct narratives (these can be both explicit and implicit, conscious or below surface awareness) to account for how the situation and all its players arrived at the current pass. For some professions, this is an explicit and expected act. Schön (1983) and Bruner (1990) discuss how psychotherapists need to construct explicit narratives for how their patients' life histories have resulted in their current problems, and help patients to reconstruct their own self-narratives (why things happen, how they react, etc.). Such narratives need to be both of high quality (internally consistent, evocative, inclusive) and helpful (they must be useful in the treatment of the patient as well as for communication with other therapists).

**Element A.3**: Dewey mentions how artists must strive to eliminate prejudices, preconceptions, and personal desires in the construction of their work (1934: 259). As a vector for action it complements element A.1; at the same time one realizes that one imposes one’s own view on a situation, one must attempt to minimize its effects.

**Element A.4**: Schön discusses the need for personal authenticity in the attitude of the professional in the practice setting (1987: 97).

**Element A.5**: McCarthy & Wright draw on Bakhtin's formulations of openness and dialogicity in their reconstruction of the role of the designer. Designers should have commitments to construct both

their mediated objects and other interventions in such ways as to preserve the possibilities for openness and dialogicity (2004: 71-74).

**Element A.6**: In Dewey's educational as well as his aesthetic theories, he stresses the importance of overcoming checks and resistance in the situation of learning or aesthetic creation (1997: 75), closely related to sensemaking.

**Elements A.7, A.8**: Throughout the process of wrestling with adverse or difficult events or roadblocks, practitioners must also maintain a commitment to clarity of expression and focus in their communication with participants as well as production of artifacts that are clear, expressive, and helpful (McCarthy & Wright, 2004: 207-208).

#### 2.2.5.4 Component B: Stance towards participants and others

**Element B.1**: Dewey discusses the importance of "personal impulse and desire" (1938: 70) on the part of students in a learning situation. Such desires are always both motivating and potentially conflictual factors in any practice situation. Practitioners need to be cognizant of this on the part of each participant as an individual as well as collective goals and impulses. Such desires may well be operating as motivating forces even if the practitioners are completely unaware of the specifics. Schön discusses how the emotional and personal dimensions of practice are always factors, and that coaches in reflective practicums must keep a focus on what's "bothering" the student in their attempts to perform as well as communicate with the coach (1987: 112-114).

**Element B.2:** The idea of unfinalizability is a central concept for McCarthy & Wright in their reading of Bakhtin. This goes beyond the idea of subjectivity to the "irreducible totality" of the meanings, feelings, and values in a situation (2004: 85). Practitioners should not attempt to reduce the situation of practice to preconceived patterns (or at least be highly cautious in doing so), but beyond this should also preserve room for surprise, imagination, and creativity to emerge. There should not be a closing off of these possibilities, no matter how things appear on the surface (in part because

any such perception of “closed-off-ness” is itself likely to be shot through with preconceptions and values imposed on the situation.

**Element B.3**: McCarthy & Wright argue for a dialogic vs. monologic (“reification or finalization”) or dialectic (e.g. Lave's “person-acting-in-a-setting” accounts [1988: 17], which would be “lifeless” as they “reify individual agency”) orientation toward experience. A dialogic orientation should inform a practitioner’s stance, keeping alive the potential for change and creative response in a situation. They call for being sensitive to the “intonations” of the different voices involved, as opposed to summarizing them into “monologic” abstractions and types (2004: 71-74), to “create something new out of what is given.” Practitioner actions and representations should preserve an “addressive surplus” of meaning and not close off dialogue (Wright & McCarthy, 2005).

#### 2.2.5.5 Component C: Stance towards the event or situation as a whole

**Element C.1**: Dewey argues for a high degree of connection and integration in an experience. Following the idea of aesthetic experience as the highest form, such an experience can result in a heightened degree of connection between people, setting, purpose, and medium:

> The unique distinguishing feature of esthetic experience is exactly the fact that no such distinction of self and object exists in it, since it is esthetic in the degree in which organism and environment cooperate to institute an experience in which the two are so fully integrated that each disappears. (1934*:* 259)

For Dewey, this is a manifestation of an “intrinsic connection” of distinct selves with the world around them (1934: 257).

**Element C.2:** The level of connection discussed in Element C.1 is dependent on communication, which in Dewey's view is undervalued in common understanding simply because it is so common. An aesthetic experience approach to communication, however, prizes and enables a degree of communication not found in prosaic experience:

> Communication through speech, oral and written, is the familiar and constant feature of social life. We tend, accordingly, to regard it as just one phenomenon among others of what we must in any case accept without question. We pass over the fact that it is the foundation and source of all activities and relations that are distinctive of internal union of human beings with one another. (1934: 348)

Communication is thus the means by which to foster the sharing of meaning: "The conveyance of meaning gives body and definiteness to the experience of the one who utters as well as to that of those who listen" (1934: 253). It enables the breaking of normally impermeable barriers between people (1934: 214).

**Element C.3:** This element involves being aware of and respectful toward the importance of the past as the background and context for all that happens in the practice setting. For Dewey this involves not only events and constraints, but also ways of seeing and acting on the materials and media in use (1934: 276-277). The challenge for the practitioner becomes how to fuse these background elements with imagination in the present, to inculcate freshness in "seeing and making" as well as sensitivity to nuance and context. The conscious attempt to combine the "foreground" elements (the dilemma or challenge facing the participants in the present, along with the methods and media in use) with the "background" can involve a long and sometimes painful period of "incubation," which must be sustained long enough to achieve a "flash of revelation" (1934: 277).

**Element C.4:** A theme throughout *Art as Experience* is the imperative to understand and work with the details of the relationships of parts to the whole. Dewey emphasizes that a key aesthetic stance is, in effect, to move back and forth from the "big picture" to small details, to "work over" not only each detail in relation to the whole, but to each other. Continuing attention to details and their relations, and the relations of details to the whole can enhance meaning and significance at each level (1934: 121).

#### 2.2.5.6 Summary

This section discussed the nature of professional ethics and the need to understand such ethics in a situated and contextual manner, as opposed to with reference to generic and abstract principles. It argued that aesthetic actions in professional contexts have ethical consequences. It proposed a diagnostic model that can be used to compares instances of actual practice against normative ideals, in such a way that foregrounds context, aesthetics, and the interactions of participants and practitioners as principal concepts.

## 2.3 Chapter summary

This chapter has described the five central dimensions of the participatory practitioner experience framework presented in section 2.1, reviewing concepts of *aesthetics*, *narrative*, *sensemaking*, *improvisation*, and *ethics*. It described each as an area of inquiry with special attention to their implications for studying professional practice. It then brought the dimensions together in a normative model that can be used as both a descriptive and diagnostic tool for instances of actual practice, as will be covered in more detail in Chapters 4 and 6.

The following chapter traces these concepts in several areas of related work.

# 3 Positioning the framework to other research

This chapter relates the theoretical framework from the previous chapter to emerging and ongoing trends in the research literature. It starts by examining critiques of various approaches to understanding professional practices analogous to participatory representation practice. The critiques point out gaps or lacks in the research, then presents arguments for how to address these gaps. It then traces the concepts through five areas of related research:

- *Computing research* includes the experience-based approach in HCI, situated activity and collaborative work, hypermedia, aesthetic computing, and software-based reflective practice.
- A section on *practitioner studies* includes discussions of reflective practice and sensemaking, aesthetics, and ethics in professional practice studies.
- Although it is closely tied to computing, *research in participatory design* (PD) is covered in its own section since it directly addresses facilitative work, including ethics and reflective PD practice and aesthetics and mediating representations in PD.
- A section on *facilitation and mediation* covers ethics in these practices, the need for multifaceted competencies and training approaches, and group support systems.
- Finally, the section on *art-making as social or professional (applied) practice* includes discussions of research in aesthetic mediation and social action, media, pedagogical, therapeutic, organizational learning and consulting practices, and artistic performance and exhibition. The chapter concludes by positioning this thesis against the themes and issues raised in the chapter.

Beyond the five dimensions discussed in section 2.2, a number of recurring themes appear in these discussions. These include the idea of aesthetic experience in general and practitioner experience in particular; the role of visual representations in communication and group work, and the nature of engagement with such representations; the importance of situation and context in studying practice; the need for a research focus on the move-by-move level of analysis when studying practice; and the limitations of practice research when focused mainly on tools, methods, and outcomes..

## 3.1 Computing research

A number of strands of computing-related research examine the themes and concepts described above. This section opens with a special focus on experience-based approach in HCI, which treats many of the themes directly. It also covers related work in situated activity and collaborative work, aesthetic computing, and hypermedia. Participatory design, which is also a strand of computing research, is treated in a separate section below, as it has an extensive literature dealing directly with facilitative practices.

### 3.1.1 The experience-based approach in HCI

Concepts of "experience" have begun to permeate HCI discourse (Hochheiser & Lazar, 2007). For advocates, the experience-based approach includes but transcends traditional HCI constructs derived from cognitive psychology, sociology, and anthropology, representing the "culmination of a user orientation in research" (Udsen & Jørgensen, 2005: 212). The approach posits "the human experience with technology as primarily aesthetic" (Wright & McCarthy, 2008: 18), appropriating pragmatic concepts of aesthetics as a reaction against functionalist and instrumentalist approaches (Udsen & Jørgensen, 2005). Following Dewey (1934), aesthetic experience is held as the highest level of "intense engagement" (Kaltenbacher, 2008: 90). Forlizzi & Battarbee characterize experience as rungs on a ladder, with mundane encounters on the level of "experience," higher levels of engagement featuring episodic beginnings and ends using Dewey's phrase of "an experience," and the highest level of connection between users and technologies as "co-experience" (2004: 263).

The approach is oriented toward a rich, affect-laden characterization of individual encounters with technology, invoking concepts like "enchantment" (Wright & McCarthy, 2008), aimed at "fostering technologies that inform, challenge, delight, and excite" (Udsen & Jørgensen, 2005: 209). For Boehner, Sengers, & Warner, aesthetic experience is "ineffable, ill-defined, and idiosyncratic" (2008: 12-1), messy and particular, inevitably situated and resistant to codification. Sensemaking is a central component of aesthetic experience. Wright et al. characterize aesthetic experience as "founded in the interplay between language, sensation, and emotion, and constituted by processes of sense-making." (2008: 18) Similarly, Bertelsen & Pold, critiquing traditional HCI techniques such as cognitive walkthroughs, describe users as always "engaged in a hermeneutic process of interpretation" rather than a "rational process of exploratory learning" (2004: 23).

#### 3.1.1.1 Critique of social approaches

Advocates of the experience-based approach often use it as a critique of earlier trends in HCI and CSCW (Udsen & Jørgensen, 2005; McCarthy & Wright, 2004; Wright & McCarthy, 2005; Wright & McCarthy, 2008). McCarthy & Wright (2004) critique the "turn to the social" in the HCI and CSCW literatures that took place in the 1980s and 1990s. They acknowledge that the turn itself was a positive development in reaction to the limitations of earlier, excessively rationalist approaches to understanding the uses and users of computer systems. While giving credit to the many helpful insights of such approaches as activity theory, social constructionism, and other frameworks, McCarthy & Wright point out that these largely avoid or elide many aspects of the actual human experience of technology, and in so doing fall largely into the same limiting rationalism as their forebears. They point out that in their zeal to reinstate the social as a focus for understanding human-computer interaction, the "turn-to-practice" theorists obscured even more fundamental aspects that have to do with the particularity and situatedness of individual, as opposed to collective, experience of and response to technology (2004: 47).

#### 3.1.1.2 Reconceiving the role of the designer

Most examples of the experience-based approach appear to be directed more towards alternative ways of characterizing users, rather than explicit considerations of the role of designers as practitioners (Kaltenbacher, 2008). However the considerations, by extension, can help to define or redefine a practitioner stance for design professionals. If one is to design from this perspective, one's professional stance must encompass these precepts. When designers as practitioners are discussed in this literature, it is often in the context of concepts to guide the process of "experience design" (Bardzwell, 2010; Boehner, Sengers, & Warner, 2008; Forlizzi & Battarbee, 2004) rather than an explicit focus on the practitioner experience itself.

Nonetheless, the concepts put forward by members of the experience school are highly applicable to characterization of a constructive role such as that of a participatory representational practitioner. Udsen & Jørgensen (2005) hint toward practitioner ethics when they state that designers employing an experience-based approach should actively seek "to develop value-based qualities" for the person-machine interaction they are designing. Boehner, Sengers, & Warner argue that integrating aesthetics in HCI means that designers themselves must change their professional stance: "designing for aesthetic experience entails bringing aesthetics into one's practice as well as influencing the design space one approaches" (2008: 12:22). Leahu et al. attempt to do this in their design of a participatory "emotion mapping" system, eschewing traditional design approaches in favor of balancing objective and subjective approaches to both design and use: "We therefore structured our exploratory study as an open-ended, participatory event and included ourselves as full participants" (2008: 428). Boehner, Sengers, & Warner (2008) take a similar stance toward their role as both designers and users of the Affector system. Suchman discusses a form of practitioner experience in her description of how she and her Xerox colleagues were caught up in a web of relationships in their efforts to inculcate a practice of technology design informed by ethnography: "The simple dichotomy of technology production and use masks … what is in actuality an increasingly dense and

differentiated layering of people, activities and things, each operating within a limited sphere of knowing and acting that includes variously crude or sophisticated conceptualizations of the others." (2003: 6), leading to a realization that the technical artifacts they designed were inevitably laden with subjectivity. She goes on to assert that practitioners must be aware of their own web of personal and organizational relationships and inherent subjectivity when designing artifacts. Wright & McCarthy (2008: 638) assert that a fleshed-out understanding of users requires that designers possess an ethical orientation towards the use situation as encompassing "self, artifacts, and settings," all as "centers of value interacting with each other." Employing a narrative perspective can evoke "empathic encounters… understanding what it feels like to be the other" (2008: 642).

### 3.1.2 Theories of activity and cognition

The nature of practice has been a focus for the distributed cognition, external cognition, social constructionist, and situated activity schools in CSCW, HCI, and related fields (Rogers, 2004). Activity theorists (e.g. Engeström , 1993; Nardi, 2002), look at the various levels of interaction occurring in an actual life situation (as opposed to an idealized or laboratory setting), paying special attention to the ways in which social and historical context, interpersonal interactions, artifact creation, and tool use interrelate in a particular setting. The approach emphasizes the ways in which "individual consciousness arises from practical activity in the world and the experience accumulated over a lifetime" (Nardi, 2002: 273). Theorists of distributed cognition (e.g. Halverson, 2002; Hollans et al., 2000) analyze the ways that cognitive processes can be distributed across "the members of a social group," "internal and external (material or environmental) structure," and "through time in such a way that the products of earlier events can transform the nature of later events" (Hollans et al., 2000: 176). Much work in distributed cognition (as well as the related school of external cognition, e.g. Scaife & Rogers, 1996) examines the role of representations, especially how a representation can be a "partner or cognitive ally in the struggle to control activity" (Hollan et al., 2000: 192). Taken together, these approaches illuminate dimensions of practice such as problems and breakdowns,

interdependencies between the actors, relationships between roles and groups, and the situatedness of practice (Rogers, 2004; Zeiliger et al., 2008).

As argued by Nardi (2002), a chief difference between activity theory and distributed cognition is that distributed cognition theorists emphasize what is observable, steering away from “hidden” aspects like emotion that an activity theorist might examine. While Halverson (2002) correctly notes that emotions are not directly observable, the aesthetic and ethical aspects of a representational practice can be observed in the artifacts, manipulations of the tools creating the artifacts, interactions between people, and other observable traces. Work such as Keller & Keller's analysis (1993) of an expert blacksmith's making of a spoon focus on the “open-ended processes of improvisation” that such a practitioner uses, providing rich descriptions of not only the individual's actions and thought processes, but the way in which cultural expectations and contractual relationships interweave with the apparently “individual” work of the practitioner. Shariq uses activity theory to analyze organizational sensemaking of mediating representations in knowledge management systems, asserting that "any analysis must go well beyond the consideration of individual artifact, it must address the complete context of organizational knowledge activity” (1998: 14). Much work in these fields also focuses on the “complex and demanding” coordination required in collaborative work settings, highlighting the need for people to perform articulation work (Schmidt & Bannon, 1992). They look less often at the subjective experience of particular individuals or on unique, creative, emergent, and anomalous events, preferring to focus on the characteristics of an ongoing system, the distributed nature of activity, and the social context of the work practices involved.

### 3.1.3 Software-based reflective practice

A parallel thread of research advocates software-based tools that can diagnose where reflection on the part of professional practitioners might assist their efforts. Redmiles & Nakakoji (2004) and Fischer et al. (2004) describe software to evoke reflective design thinking in software design.

Redmiles (2002) advocates activity theory as the vehicle to understand where software-based reflection should be addressed, while Collins et al. (2002) describe a project at a large software company that applied activity theory to understand user needs. A common thread of this research is that the grainsize of analysis is the whole-project level, for example describing the conflicts and tensions between the different communities, teams, and roles involved in a project, rather than the more individual, subjective, move-by-move level of the experiential approaches described above.

### 3.1.4 Aesthetic computing

Research in aesthetic computing, though highly concerned with aesthetics and representations, approaches these from the standpoint of mathematics and computer science, rather than from a social or experiential perspective. Fishwick defines aesthetic computing as the application of "the theory and practice of art and design to the field of computing," citing three levels of "art-computing integration." The cultural level refers to collaborations between artists and computer scientists and artifacts (such as programming languages) that "are affected by an introduction of the expanding role of aesthetics or contact with designers and artists." The implementation level concerns computing artifacts which produce "artistic" behavior (e.g. visual patterns associated with specific computing constructs). The representational level expands into "structural" as well as behavioral aspects like information visualization (2008: 1-2). An exemplar of research in this area is Bateman et al. (2010), who conducted an experiment to determine how much "useful junk" (visual embellishment) makes a difference to end users of charting software. Although such research often calls for HCI to pay more attention to aesthetics (Tractinsky, 1997), it tends to stay on the functionalist level (Bertelsen & Pold, 2004).

### 3.1.5 Hypermedia

Although there has long been interest in hypermedia for group support and facilitation (Conklin & Yakemovich, 1991), as well as in using hypermedia as a literary and art form, there has been little research that directly addresses what it means to perform such practices from a practitioner point of

view. Most work that touches on practice looks at novices learning to use hypermedia tools[6] (e.g. Bromme & Stahl, 2002), or examines the artifacts themselves, focusing on the "intellectual work" (Marshall, 2001) of hypermedia practice, with a relatively functionalist view of what skills such work encompasses.

There is much hypermedia research focusing on highly complex domains such as software engineering (Scacchi, 2002; Noll & Scacchi, 1999), library science (Nnadi & Bieber, 2004), and legal argumentation (Carr, 2003). Although few would dispute that a high level of skill, training, and experience is required to be successful in these fields, the specifically hypertextual aspects of the skills required are given little attention. Many of these approaches implicitly assume a high degree of hypermedia literacy, skill, and even artistry on the part of their users, but rarely treat these matters explicitly. Promising hypertext approaches, such as the DR field in the 1980s and 90s (Fischer et al., 1996), have been dismissed or abandoned precisely because they appeared to require a high level of skill to perform effectively. Even within the realm of hypertext literature research, there is little attention paid to practitioner and practice issues. Most research in the field focuses on textual criticism of the artifacts themselves (Koskimaa, 2000; Miles, 2003), or on navigation and reading, rather than on the process of construction.

When hypertext authoring skills are treated head on, it is most often in terms that emphasize similarities and differences with conventional notions of writing and reading (Landow, 1991; Barnes, 1994). These, while often valuable, only paint a portion of the picture. This is especially so when referring to constructing hypermedia representations for groups in real time, with the active participation of the members, rather than building stand-alone hypertexts as a solitary activity, meant for solitary readers to review and navigate. For example, Emmet & Cleland's study (2002) of a

[6] This is also true for other disciplines looking at professional practice. For example, Cross (2003) observed this for studies of professional designers: "Most studies of designer behaviour have been based on novices (e.g. students) or, at best, designers of relatively modest talents."

hypermedia tool used for constructing narrative and graphical representations of safety issues focuses solely on tool features as the means to address issues of authoring and representational complexity and sufficiency.

One area of hypermedia research that touches on issues of more central concern to this thesis is the literature on argumentation-based hypertext tools. This area, if mostly indirectly, addresses questions of practitioner skill and experience in constructing representations of DR. Most work in this area has treated the problems with these tools as aspects of the software or methodology itself, rather than addressing the practitioner side of the equation directly. One example is the rapidity with which users can create confusing and hard-to-navigate information spaces. Conklin (1987) identified the "lost in hyperspace" problem with such hypertext tools early on, and later researchers report problems of disorientation and cognitive overhead as disadvantages (e.g. Buckingham Shum & Hammond, 1994).

Researchers in hypertext for DR have observed that users experience dissonance between the activity of "doing design" and the need to surface and record rationale. Buckingham Shum (1996) notes "the difficulty of representing useful design rationale while engaging in artifact construction … rapid testing and changing of the [design] artifact, coupled with a reluctance or even inability to interrupt and articulate one's process" results in either incomplete DR or incomplete design, as well as some degree of frustration. He goes on to invoke Schön's concept of "knowing-in-action" in characterizing skilled design as "spontaneous, skillful execution of the performance" in which designers "are characteristically unable to make [the rationale for their actions] verbally explicit." Conklin & Begeman (1988) noted that "it is somewhat unnatural to break one's thoughts into discrete units, in particular when one doesn't understand the problem well."

Many advocates of argumentation-based hypertext approaches have gone to some pains to elaborate formal structures for precisely representing DR, mandating that users make and record semantic distinctions in the course of design. Much of the literature contains arguments for the

relative merits of various rhetorical models, such as QOC (Maclean et al., 1991), PHI (Fischer et al., 1996), DRL (Lee & Lai, 1996), and variants of IBIS (Kunz & Rittel, 1970). But many have found that, in practice, the sophistication of the distinctions that the structures provide also means that they are too complex or confusing to use, particularly in applied design settings (e.g. Buckingham Shum, 1996; Halasz, 1988). However, later work cites successful applications of the approach, highlighting the role of practitioner skill and experience in bringing about successful outcomes (e.g. Selvin, 1999; Conklin et al., 2001; Conklin, 2005; Buckingham Shum et al., 2006; Buckingham Shum, 2007).

### 3.1.6 Summary

Although it addresses many aspects of how HCI practitioners and researchers should approach their work, for the most part, the experience-based approach does not directly discuss practitioner actions and choice-making. Instead these are largely treated as overarching imperatives, implying that practitioners adopting this stance must change their orientation towards their work as designers. While much research in situated activity and collaborative work, hypermedia, aesthetic computing, and software-based reflective practice touches on ideas of practitioner skill and the aesthetic aspects of representations, this literature largely does not emphasize the main concerns of practitioner experience as described in Chapter 2, particularly the sensemaking, improvisation, and ethical dimensions**.** Computing research that places these considerations at center stage, especially focusing on constructive roles such as practitioners performing articulation work, could fill many of the gaps identified by critical and experiential HCI researchers. The following section explores how practitioner experience, sensemaking, reflection, and other aspects are examined in practitioner studies and research on reflective practice and organizational change.

## 3.2 Practitioner studies and reflective practice

The research in this section spans a number of disciplines with the common thread of addressing professional practice as a general phenomenon (as opposed to focusing on a single practice). The research emphasizes the complex interplay of issues and dimensions at work in the actions of a

professional engaged in their practice, interacting within the context surrounding a particular instance of practice.

The lack of verbal articulation in no way detracts from the depth, subtlety, or efficacy of actions, though it places a heavier burden on those who would observe and characterize how the expertise plays out in practice. As applied to practice which occurs in a professional context of providing expert servicing to project and participants, a phenomenological or experiential approach goes against conventional understanding of expert skill as an application of prescribed behaviors in set ways. This is a subject of central concern to Schön's account of professional practice.

In studying practitioner aesthetics and ethics, various researchers stress the importance of looking at both macro and micro levels. Researchers studying expert practice stress the importance of in situ analysis (e.g. Petre, 2003). Activity theorists prescribe understanding practitioner subjectivity in terms of its surrounding context: "Individual subjectivity and action are always located. They can only be properly studied in the relation to a peculiar social context" (Dreir, 1993). Similarly, Sawyer advocates making individual interactional moves the focus of analysis, making them the entity that is related to the surrounding social context per the socioculturalist agenda, stating that this is the best way to understand group improvisation (Sawyer, 1999).

Actors in problematic organizational situations always approach the situation and each other with a set of partially overlapping interests, goals, relationships, and concerns. This often means looking at the significance of small moves. Browning & Boudès cite Snowden's emphasis on small grainsize actions that "allow the group to move on – to accept "good enough," implement it, and then see what that action means" (2005: 36).

### 3.2.1 Experiential studies of professional practice

Many researchers explicitly invoke combinations of the experiential dimensions described in section 2.2 in their studies of professional practice. Eisenberg characterizes Weick's work on sensemaking in organizations (1995) as advocating "heedful interrelating" as both an ethical stance and an aesthetic

of professional action in which improvisation is central (2006: 272), a perspective also found in Weick et al. (2005). Johannson & Heide (2008) examine narrative and sensemaking in organizational change, advocating context-specific studies of communication acts, a combination also seen in van Vuuren & Elving (2008). Macfarlane (2002), in her advocacy of reflective practice for professional mediators, entwines Schön's concepts of professional artistry and sensemaking with the ethics of mediation. Barrett (1998) and Hatch (1999) invoke aesthetics, narrative, improvisation, sensemaking, and ethics in their comparisons of jazz improvisation with organizational change and professional action (also seen in Schön, 1983 and Sawyer, 1996, 1999, 2003), emphasizing the need to understand the tacit, intuitive, and emotional aspects of expertise (Hatch, 1999: 79) in the ambiguity-laden environment professionals move within. Barrett encompasses the five dimensions in his case studies of "enactments" in jazz performance. For instance, he describes how errors and mistakes (prompting sensemaking) in the course of a performance can be turned into aesthetic opportunities, touching on the way the performers support each other (ethics) as well as how specific moves can stitch a mistake into a reforged "story" of the piece (1998: 610-611).

### 3.2.2 Sensemaking in professional practice

Schön's conception of reflection-in-action "hinges on the experience of surprise"; an expert professional is able to respond to this with an artful, sophisticated exploration of the "understanding which he surfaces, criticizes, restructures and embodies in further action" (1983: 50). Such professionals engage in a "conversation with the situation," which Aakhus characterizes as a "design" activity (2003). Weick places the ideas of authoring and practitioner action at the center of his conception of sensemaking in organizations. Sensemaking is not just a reaction or response to an event, but happens in the course of action. "Problems do not present themselves to the practitioners as givens. They must be constructed from the material of problematic situations which are puzzling, troubling, and uncertain" (Weick, 1995: 9). Russell et al. (2009) argue that sensemaking itself can be the core of professional practice for practitioners such as researchers, designers, and intelligence agents. Van Vuuren & Elving draw a direct link between sensemaking and organizational

communication, including the "storytelling" that occurs in times of organizational change: "By suggesting a logical order for events, one imposes a frame of occurrences to attach meaning to a selection of cues." (2008: 356) Even without explicit storytelling, a practitioner is often engaged in narrative; it is inescapable in the prescription of meaning: "Conversations help to make sense of situations by providing a narrative structure for the interpretation of events" (2008: 352). For Bansler & Havn, technology-use mediation is a sensemaking process (2006: 56-57). Like Weick et al (2005:416), they argue that sensemaking is bound up not only with context but with identity construction, quoting Weick et al.:.

### 3.2.3 Aesthetics in professional practice

Recalling the concept of "an experience" as the highest aesthetic state (Dewey, 1934; McCarthy & Wright, 2004), Csikszentmihalyi (1991) posits "flow" as an ideal state for practitioners to reach in the performance of their professional role. Hatch appropriates the flow concept in her comparison of jazz improvisers with organizational change practitioners, labeling it as a "subjective state" of "effortless performance" (1999: 89-90). She finds professional actors in this state possessing the same qualities: "Rhythm, harmony, groove and feel have emotional and aesthetic dimensions, and when these aspects of work processes are engaged we may likewise find the experience of flow" (1999: 89-90).

Macfarlane invokes Schön's concept of professional artistry in her embedding of aesthetics in reflective mediation, noting that it requires "the capacity to deal with unique and uncertain areas of practice by drawing on past experiences and by constantly experimenting and revising" (Macfarlane, 2002: 71). Macfarlane, as well as Aakhus (2003), argues that professional practices like mediation are design activities, and thus inherently concerned with aesthetics. Professionals are engaged in design "whenever they engage in decision making under anything other than routine or predictable circumstances" (2002: 72). Schön's descriptions of experiential learning and coaching are focused on the way "design" happens in the particular media his practitioners work in, such as an architect's drawings or a musician's performance on their instrument. He describes the nuances of attempt and

expression on the part of both students and coaches in their chosen medium, relating the purposes they struggle to achieve through the way they attempt to work over their subject matter in the materials of that medium (1987: 204).

Schön emphasizes that students of a practice must learn to be conscious of their actions as sequences of moves made for particular reasons and "break into manageable parts what had at first appeared to be a seamless flow of movement" (1987: 112). They are assisted in this by their coach's more skillful ability to provide such move-by-move characterizations, grounded as they are in a greater awareness of nuance and alternative possibilities for action (1987: 111).

### 3.2.4 Ethics in professional practice

Schön (1983: 295-6) argued for practitioners to take active and conscious ethical stances, recommending reflection-in-action as the means to achieve this. Even when practitioners such as mediators make their choices intuitively, those choices contain implicit values by which they navigate ethical dilemmas. Reflection brings them to the surface so they can be surfaced so they can be critiqued and discussed, not remain tacit (Macfarlane, 2002). This will assist reflective practitioners to ethically tailor their actions to its context (Yoong & Pauleen, 2004).

Critics of the concept of professional neutrality or objectivity, such as Bansler & Havn (2006), argue that practitioners such as technology-use mediators (or, for DiSalvo et al. (2009), HCI researchers and designers) are always engaged in sensemaking and their actions "enact" the technology rather than simply "implement" it. They inherently affect the environment surrounding the technology. Suchman argues that R&D professionals are never simply neutral "makers" but must exhibit "located accountability" as an ethical stance, one tied to the "web of relationships" in the specific context they are operating within (2003: 6).

Of particular interest to representational practice is research exploring the interplay of aesthetic choices with ethical responsibilities. Hatch (1999: 80) discusses how jazz musicians in the course of improvised performances must choose how to direct their attention, whether primarily to their own

playing, to one or two of the other musicians, or to the band as a whole. Each choice has different implications for their own performance and for the ensemble's performance. They must balance the need to simultaneously listen and play (a stance similar to Weick's "heedful interrelating" [Eisenberg, 2006; Weick, 1995]).Effective performance must consist of both, analogous to any sort of professional interaction with clients where exercise of one's own professional skill must always be balanced with the need to appreciate the client's problem situation (Checkland & Scholes, 1990; Cooperrider & Srivastva, 1987) and listen to what the clients themselves have to say. Similarly, Barrett (1998), in his comparison of jazz improvisation to organizational change practice, discusses how musicians must choose whether to rely on tried-and-true "stock phrases" in their soloing, snippets which have worked well in the past ("readymades" in Sawyer's (1996) terminology, but can risk disfavor from colleagues and fans for repeating themselves (1998: 608). He discusses the different ethical styles of seminal bandleaders, for example characterizing Miles Davis as a practitioner of "provocative competence," intentionally "creating incremental obstacles and nurturing small disruptions" in order to "make it impossible for members to rely on habitual responses and rote thinking" (1998: 609). Kurtz & Snowden (2003: 466) discuss how even progressive teachers must similarly balance "freedom" and the need to intervene in the way their students act in class to ensure an overall climate of learning.

### 3.2.5 Summary

This section discussed research on experience, ethics, aesthetics, and sensemaking across a broad spectrum of professional practice. Much work in this area emphasizes experiential dimensions as well as a methodological concern with *in situ* studies taking surrounding context into account, as well as a focus on small interactional moves in order to understand the meaning of practitioner actions. According to Macfarlane, new practices (such as participatory representational practice) need to emphasize reflection even more than established, more codified practices, because the kind of actions and interventions they entail are "diversified, unregulated, and context-dependent"

(2002: 73). The following sections describe how the same set of ideas percolate through research disciplines concerned with specific professional practices, starting with participatory design.

## 3.3 Participatory design

In some ways, PD research would seem to be the closest to the central concerns of this thesis. Many researchers have discussed the ways that visual representations can bridge between end-users' and designers' perspectives in participatory design efforts (e.g. Greenbaum & Kyng, 1991; Blomberg & Henderson, 1990; Chin & Rosson, 1998; Muller, 1991). However, discussions of practitioner issues, particularly those close to the concerns described in sections 2.1 and 2.2, have mainly remained in the background. Many PD studies treat practitioner concerns at a distance, if at all, or touch on them only at the level of project planning, selection of tools and techniques, or discussions of a project's functioning as a whole, rather than analyzing practitioner choices at the move-by-move level in sessions with participants. Bergvall-Kåreborn & Ståhlbrost performed a review of all 15 articles in the 2006 Participatory Design conference, noting that only three of the fifteen had "an ethical/political perspective on PD user participation" (2008: 104). Hecht & Maass (2008), as well as Lundberg & Arvola (2007), point out the paucity of PD studies examining practitioner moves and choices at the granular level. Extending this critique,

Table 3.1 presents thirteen examples drawn from recent PD papers and conferences, discussing each in terms of its limitations in helping to understand practitioner experience. This is in no way meant to imply the papers are without value: while containing much worthwhile discussion of PD concepts and techniques, the critique here is limited to underscoring the point that much work in the field does not treat the kinds of practitioner experience issues with which this thesis is concerned.

**Table 3.1: Limitations of selected recent PD studies for understanding practice**

| Authors | Studied area | Emphasis | Direct relationship to practitioner experience dimensions |
|---|---|---|---|
| Törpel, 2006 | "Design game" technique in PD and design education | Discusses the technique itself and issues in applying it; practitioner role discussed only in terms of applying the technique | None |
| Bødker & Iversen, 2002 | Reflective approach to PD in a long-term project in a wastewater treatment plant | Choosing methods and thinking about how they are working and what methods to choose, stays mostly at the level of planning rather than acting | Mention of reflection, but not applied at the moves and choices level except in planning |
| Merkel et al., 2004 | PD with community groups | Grainsize is the whole effort, techniques used, role definition, stance in general (focus on 'sustainability' for the community groups they worked with) | Mentions ethical responsibilities for practitioners, though at the whole-project level |
| Iversen & Dindler, 2008 | Using aesthetics in a facilitative technique | Application of a "fictional inquiry" technique for a museum exhibit. Speaks about practice in terms of tools and techniques, not practitioners | Strongly advocates paying attention to pragmatist aesthetics in PD, though mostly in terms of user/participant experience |
| Wagner & Piccoli, 2007 | Pitfalls of user involvement in IT projects | Discusses the realities and limitations of involving users in PD projects at different times. Practitioner role not discussed, except as a behind-the-scenes chooser of methods and timing | Ethical implications in emphasis on need for practitioners to 'listen and learn' from participants |
| Wu et al., 2004 | PD for amnesic individuals | Choices about and applications of techniques, implications for participants and outcomes; does not discuss practitioners themselves | None |

| Authors | Studied area | Emphasis | Direct relationship to practitioner experience dimensions |
|---|---|---|---|
| Boyd-Graber et al., 2006 | Iterative development of a system to help aphasic people | Discusses how PD rounds were structured and the nature of the interaction with the participants. No mention of practitioner role or choices | None |
| Danielsson et al., 2008 | PD for distributed design teams | Discusses techniques and tools, not practice issues | None |
| Watkins, 2007 | Participatory content creation for a museum project | Choices and outcomes of process and technique selection. No mention of facilitation or practitioner issues | None |
| Ekelin et al., 2008 | Storytelling method for PD workshop | Describes the method. No mention of practitioner issues | None |
| Clark, 2008 | Project planning for a municipal PD project | Focuses on direct practitioner actions, involvement, and dilemmas in the planning and stakeholdering of a project | Relevant to practitioner ethics and sensemaking, though only in the planning process |
| Zeiliger et al., 2008 | PD for a social media project concerning communities of practice | Discusses three types of pitfalls encountered in the project, involving user needs, boundary objects, and user participation | Practitioner ethics and interactional perspective, though at the level of the whole project |
| DiSalvo et al., 2008 | PD effort involving robotics in a neighborhood networking project | Emphasizes role of creative argumentation in a PD project. Mostly covering approach and participant reactions, uptake, and outcomes | None |

### 3.3.1 Ethics and reflective PD practice

Some PD researchers do make practitioner ethics, facilitation, and reflective practice a major focus.

Dearden & Rivzi (2008) discuss PD practitioners' interpersonal and facilitative skills, stressing the

ethical dimensions of their role, such as the need to pay attention to power relationships in a project. They argue that listening and relationship-building need to be seen as core skills in PD, and that PD practitioners need to be reflective about their practice. Bergvall-Kåreborn & Ståhlbrost make distinctions between three main types of PD: "Design for users," "design with users," and "design by users," arguing that only the latter type treats designers as facilitators. They point out that none of the articles they review follows this type: "Within the information systems field taken broadly this is still a highly unusual approach" (2008: 106).

Lundberg & Arvola (2007) evaluated the role of PD facilitation in card-sorting exercises, stressing the need to analyze the move-by-move level, and arguing that such facilitators need to move beyond "rote" interventions (such as reminding users to fill in the cards) with more "creative" moves. They discuss the ethical trade-offs inherent in deciding when to intervene as part of moving a design process along vs. allowing participants to pursue discussions that may not be part of the agenda (2007: 53). Hecht & Maass (2008) argue that PD facilitation needs to be a subject of direct research consideration. In their view, facilitators need to be trained in interactional and reflective practice techniques in order to make ethical choices. They claim that PD research that stays on the level of methods or tools is not enough, and that facilitating PD requires highly developed communication and interpersonal skills.

Bødker & Iversen argue that a "change of discourse" is needed in the PD field, which needs to be a "fully professional practice" requiring effective facilitation "in order to yield the full potentiality of user involvement." This can only come about through "ongoing reflection and off-loop reflection among practitioners" (2002: 11). Merkel et al. advocate that practitioners of community-based PD must reconceive their role "to avoid becoming yet another temporary resource taking on the role of the consultant who builds something, leaving behind a system that is difficult to use, fix, and modify" (2004: 2). Wagner & Piccoli argue that PD practitioners must change their orientation toward users and participants, especially learning to listen closely to participants during design sessions and adjusting expectations about the design accordingly, including their own (2007: 55).

Clark focuses on practitioner actions, involvement, and dilemmas in the context of PD project planning, stressing that practitioners need to be able to explain why participants and stakeholders will see value in methods and techniques that can appear "trivial, foreign, unnecessary, threatening and/or inefficient" (2008: 206). He provides excerpts from specific meetings as examples, looking at them through a performative lens (for example, as participants attempt to negotiate for project resources with governing boards). Similarly, Zeiliger et al. mention the issue of practitioner involvement from an ethical and interactional perspective, at the level of the whole project, in their description of pitfalls in PD projects (2008: 228).

### 3.3.2 Aesthetics and mediating representations in PD

Although PD has been critiqued for ignoring or downplaying aesthetics (Bertelsen & Pold 2004), some researchers look at the importance of mediating representations in PD projects. For example, Hecht & Maass (2008) claim that such representations can play a central role, especially in teams with diverse kinds of participants: "Artifacts or representations that make sense to everybody facilitate cooperative work" (2008: 166). In their study of participatory mural creation at an interfaith conference, Tyler et al. (2005) describe how graphic facilitators used various means to encourage the participants to engage directly in decisions about what the representations should show (2005: 148). Iversen & Dindler advocate "tipping the scale towards transcendence" (2008: 138) by emphasizing the "aesthetic level" and skills of "aesthetic inquiry" in PD projects, requiring practitioners to attain familiarity with aesthetic concepts. Edmonds et al. (2006) discuss how practitioners created engagement with interactive artworks by constructing a participatory "research studio" at a museum in Sydney, where the public could interact with artists in the process of refining the interactive objects.

### 3.3.3 Summary

This section reported on treatments of ethical and aesthetic concerns in PD research, reporting on both their presence and their absence. Although PD efforts nearly always involve some level of

facilitation, accounts of practice and research reports often leave the concerns, dilemmas, and experiential aspects of the practice in the background. Little work examines PD facilitation at the move-by-move level or provides close analysis of the interactions of participants and practitioners with visual representations. Many PD researchers have called for increased emphasis on PD facilitation as a professional practice, requiring the sort of reflective and experiential approaches discussed in section 3.2.

The following section treats research on facilitative and mediation practices beyond the specific context of PD.

## 3.4 Facilitation and mediation

This section looks at a number of areas that treat the practice of facilitation generally, as well as specific facilitative techniques and research areas, such as group support systems. "Facilitation" as a term covers a broad spectrum of approaches and disciplines. Hunter & Thorpe list the following:

> group facilitation, meeting facilitation, learning facilitation, self-facilitation, organizational facilitation, community facilitation, facilitation of personal development, facilitation of public consultation, disaster relief facilitation, facilitative management, and facilitative leadership (2005: 553-554).

Most guidelines and overviews of meeting facilitation take a somewhat generic and neutral approach to setting up and running meetings. Generally, guidelines stress concepts such as a meeting's purpose, goals, anticipated outcomes, objectives, agenda, pre-meeting tasks, attendee selection, role definition, ground rules, materials or audio-visual aids, meeting location, decision-making techniques, handling conflict, assigning action items, assessing meeting performance and developing plans for improvement (Heathfield, undated; Duncan, undated).

### 3.4.1 Ethics in facilitation and mediation

Kolb et al. discuss the centrality of ethics in their model of small group facilitator competencies: "professional ethics issues permeate the role of facilitator and serve as the foundation for many decisions made by people in this role" (2008: 129). As with participatory design, however, much literature in this area stays on the level of tools, methods, and cause-and-effect outcome studies. Such research offers advice on choosing techniques, but little that would help a facilitator choose actions in the moment, employing reflective or other conscious ethical criteria. For example, Hartwig (2010) analyzes his own facilitative performance using the "devil's advocate" technique, placing most of the emphasis on the group and in the technique. He stresses his adherence to the IAF Code of Ethics (International Association of Facilitators, 2004) and his efforts to remain neutral throughout the process. In Billikopf's description of an approach called the Negotiated Performance Appraisal Model, the role and process of facilitation is treated generically, typified by statements such as: "A vital role played by the facilitator during the joint session is helping subordinate and supervisor move past acknowledging challenges and weaknesses to creating workable plans for change." (2010: 37). Similarly, De Lichtenberg & London's diagnostic framework presents facilitation as a rationalist choosing of methods: "The facilitator draws on theory and research that indicate interventions that are most promising for different situations" (2008: 38). Cortesi (2001) examined ninety meetings using observation and surveys, looking for causation and predictive patterns such as deterministic effects of communication channel used (e.g., videoconferencing vs. face-to-face) by a facilitator. McFadzean's study of facilitation competencies, although it provides a useful taxonomy of practitioner skills and ethical dimensions and mentions the need for facilitator self-assessment and critical thinking (2002: 548), similarly stresses facilitator neutrality as an unproblematic concept, and does not include references to either creativity or aesthetics as needed competencies.

The idea that facilitator neutrality is a desirable, unproblematic, or sufficient concept has been widely critiqued. Aakhus argues that facilitation studies need to recognize intervention, not "objectivity," critiquing frameworks that de-emphasize the ethical "obligations and responsibilities"

of facilitative practices, arguing that "objectivity" is an inaccurate way to frame practitioner actions (2003: 228). He calls for looking more deeply at how practitioner choices actively shape and affect participants, processes, and outcomes: "Facilitators need a discourse about practice that helps them articulate how they legitimately shape the direction, content, and outcome of meetings in the way they orchestrate interactions" (2001: 364). Jacobs & Aakhus (2002) focus on what Lovelace (2001) termed the "paradox of neutrality," a theme echoed in Bush & Folger's (1994) work on transformative mediation. These require that mediators recognize the limitations of operating from an ethical stance of neutrality, arguing that, intentionally or not, mediators make choices that emphasize or de-emphasize aspects of each disputant's "side" and ways of expressing, listening to, and acting on disputant utterances and emotions. Jacobs (2002) critiques neutrality in his examination of the styles and tactics used in mediation sessions. Benjamin (2001: no page) states that "the mediator is not a remote, neutral, off-stage expert, but rather an active participant in the drama." For Stewart, "the facilitator cannot be neutral about the group's process, as both the facilitator and group discuss and reflect on the effectiveness of the processes being used" (2006: 423).

Cashtan's advocacy of "transparent facilitation" states that facilitators need a capacity of self-reflection, especially applicable during "charged moments" requiring extra "ethics" in a facilitative response (2005: 58). For Macfarlane, moral and ethical dilemmas are intrinsic to the mediator role and require personal judgment (2002: 56). Each decision to intervene lays open a universe of further choices. She argues that even apparently "functional" choices can have ethical consequences, and provides case studies of ethical choices on the move-by-move level, as do Bush & Folger (1994). Yoong (1999: 105) also argues for reflective practice as a primary training method for facilitators. For professional mediators, choice-making is constant as well as subjective: "The reality of mediation is that ethical judgment making occurs constantly, intuitively, and often unconsciously." (2002: 59). Macfarlane cites Cooks & Hale (1994) who draw connections between narrative, sensemaking, and ethics in their work on the construction of ethics in mediation. Yoong discusses the ethical dilemmas

facilitators can find themselves in due to the multiple stakeholders they serve, for example in choosing between serving "management" (e.g., client) and participant goals: "a dual role that may [suffer] from competing actions" (Zorn & Rosenfeld, 1989: 98, cited in Yoong 1999: 102).Thomas calls for research on divergences between facilitators' espoused theories, and theories-in-use (actual behavior), particularly when the facilitator encounters challenging situations. In such circumstances, "the gap between an emerging facilitator's adopted, espoused theory and his or her theory-in-use could be problematic" (2008: 10).

### 3.4.2 The need for multifaceted competencies and training approaches

Facilitating ethically in the manner suggested by these researchers highlights the need for multifaceted, multidimensional competencies, beyond the instrumental competencies suggested in many facilitation guidelines. Although some argue that facilitative expertise itself is not well understood enough to develop as the basis for effective training (e.g. Yoong & Pauleen, 2004), several researchers have proposed detailed competency models that claim to summarize all dimensions of the facilitative craft. Stewart (2006) identified 48 components of a facilitator competency model based on observation and interviews of professional facilitators (see Figure 3.1), spanning interpersonal, management, and knowledge competency areas as well as personal characteristics.

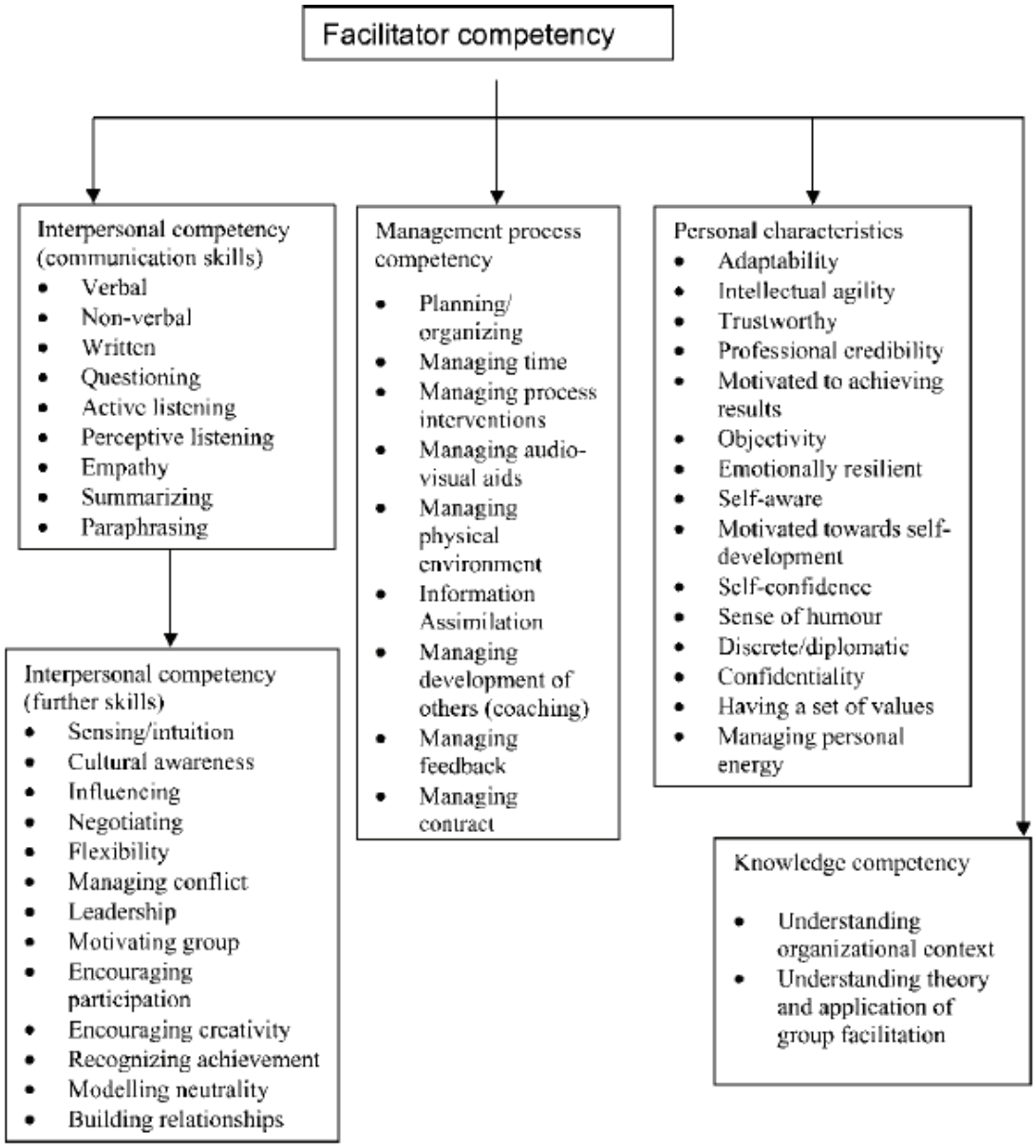



**Figure 3.1: Stewart's facilitator competency model (2006: 431)**

Similarly, Mcfadzean presents a taxonomy of practitioner skills and ethical dimensions including self-assessment and critical thinking (see Figure 3.2), identifying five competency areas: planning, group dynamics, problem-solving and decision-making, communication, and personal growth (2002: 541-543), comprising over one hundred facets. In addition, she identifies five levels of "specific" competencies depending on the level of the participant group's development: from the lowest level ("attention to the task") for teams operating in a highly structured environment that need to make quick decisions without much attention to process, to the highest ("attention to team trust") for

teams that are self-aware, tuned into each other's emotions and goals, requiring sophisticated facilitative skills akin to those of a counselor or therapist (2002: 543-546).

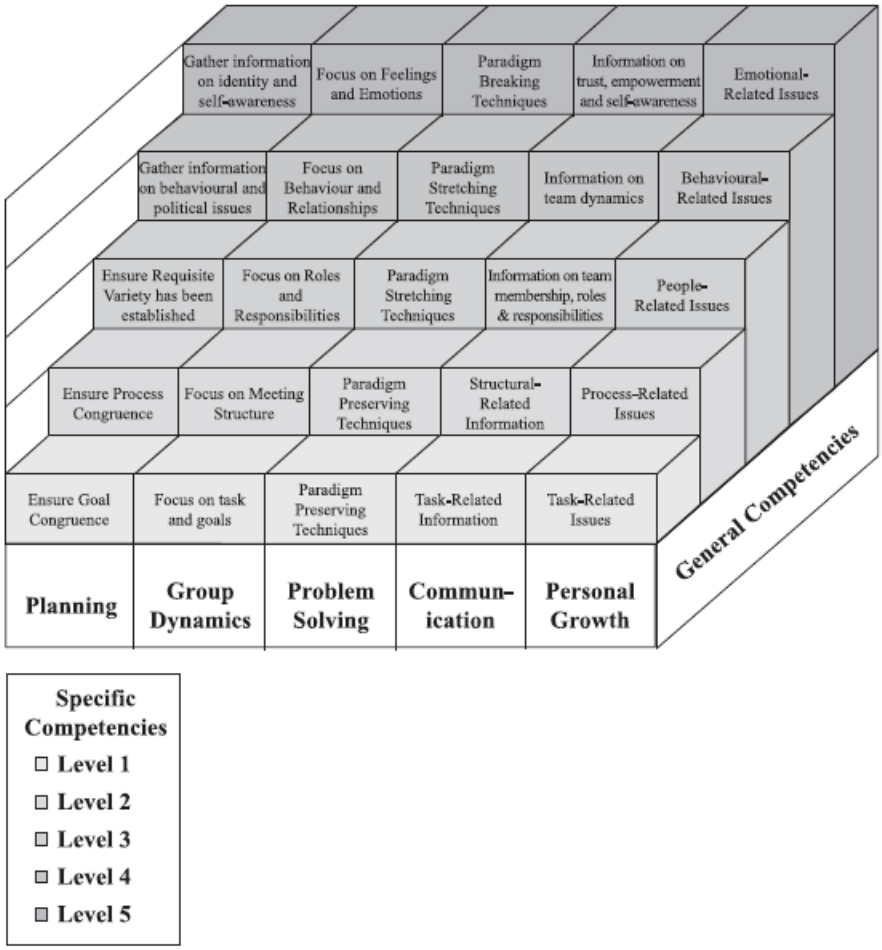



**Figure 3.2: Mcfadzean's model of "general" and "specific" facilitator competencies (2002: 547)**

Macfarlane argues that mediators require the ability to exercise personal discretion and develop a sophisticated understanding of the context for their mediation efforts (2002: 55), which "requires the capacity to deal with unique and uncertain areas of practice by drawing on past experiences and by constantly experimenting and revising" (2002: 71). She draws parallels between the skills required by mediators, counselors, and therapists in the areas of "goal setting and issue framing" (2002: 59).

Cashtan (2005) argues that facilitators require skills in reflective and empathic listening. Tyler et al. assert that graphic facilitators require multifaceted skills, experience, and training to ply their craft effectively in complex settings" (2005: 142).

Several researchers emphasize the improvisational skills needed by mediators and facilitators. Benjamin describes the "performance" artistry inherent in any skilled, committed negotiator or mediator, emphasizing both the required discipline and the ethical stance "involved" with the situation and its participants: "Against the backdrop of a carefully analyzed strategy, with practiced and disciplined technique and skill, they are able to improvise. The mediator – like the accomplished actor -- is totally involved with the dramatic environment -- intellectually, physically, and emotionally or intuitively" (2001: no page). Sawyer (2004) describes improvisational skills for mediators in the process of dialogue, managing "turn-taking, the timing and sequence of turns, participant roles and relationships, the degree of simultaneity of participation, and right of participants to speak." In the absence of a structured or pre-scripted template for managing conversational interactions, practitioners must improvise the scope, nature, and tempo of their regulation of participants' discursive flow. Beyond this regulatory role, they may also need to "notice and comment on connections" between participants and with the content.

The multifaceted nature of these skills highlights the need for reflective and experiential training approaches. In their study of facilitator competence, Kolb et al. (2008) discussed implications for teaching and assessing facilitation and coaching; recommending using videos of sessions to aid in student reflection (2008: 129-130). In his survey of facilitator education practices, Thomas calls for reflective education of facilitators while arguing against technique-centered approaches, noting that a tool-and-method-centric approach "'dumbs down' the real complexity and challenge of facilitating groups and does not accurately depict what is required to facilitate effectively" (2008: 8). As opposed to this, he argues for "a strong emphasis on the need to help emerging facilitators master self-facilitation … facilitators must be aware of, understand, and be able to manage their internal reactions to the group, especially in challenging situations" (2008: 8).

### 3.4.3 Group support systems

While much of the research in the GSS field emphasizes the technology and its effects on meetings in general (e.g. Dennis et al., 1990; Mejias et al., 1996), many studies examine the role, training, actions, and effects of a person facilitating the use of GSS technology, looking at how facilitators conceive their role and what skills appear to be related to particular kinds of outcomes (Anson et al., 1995). The main focus is on "groups" and "outcomes" as the unit of analysis, with an emphasis on "how groups define and organize themselves" (Poole & Jackson, 1993: 287). The dominant theory in GSS literature, adaptive structuration theory (AST) (Poole & Jackson, 1993; Bostrom et al., 1993), posits that groups get value from a GSS in the proportion that they absorb it into their own ways of approaching and structuring a problem and their own group process. As such AST is helpful in emphasizing the (potential) uniqueness of each group's appropriation, thus pointing to the importance of taking contextual and situational factors into account (Poole & Jackson 1993): "From an AST perspective, the role of facilitation is to select and present beneficial structures in a manner that encourages their faithful appropriation" (Bostrom et al., 1993: 163).

While there is recognition that "much of what the facilitator does is active, spontaneous and flexible," (Yoong & Pauleen, 2004) for the most part, such studies do not address experiential elements, though there has been work examining choices and dilemmas faced by GSS facilitators (Yoong & Gallupe 2002), issues faced by new GSS facilitators that touch on sensemaking and related phenomena (Clawson & Bostrom, 1996), and research that performs move-by-move analysis of practitioner actions, focusing on the "design" choices made by facilitators in the course of practice settings (Aakhus, 2001, 2004), along with calls for research focusing on more experienced practitioners as opposed to the novices (Yoong & Gallupe, 2002).

While Bostrom et al. call for qualitative research of GSS facilitation (1993: 168), and there have been a few ethnographic studies (Yoong & Gallupe, 2002; Yoong & Pauleen, 2004), much of this research possesses a "technocratic" orientation, "generally framed and studied as rational planning and

instrumental action in the service of client goals" (Aakhus, 2004). A fuller understanding requires study of the often invisible "crafting and shaping" work GSS practitioners do (Aakhus, 2003). Studies emphasizing outcome-based measures, such as participant satisfaction, may reveal important aspects of their tools, but they often miss or obscure the role of practitioner skill and agency (Aakhus, 2002).

Yoong draws connections with conventional meeting facilitation, especially its complex mixture of rational and irrational components. He cites Friedman in noting that understanding "facilitation actions, intended or unintended, is possible only with attention to situational and contextual complexities (Friedman, 1989, cited in Yoong, 1999: 86). Bostrom et al. discuss ethical concerns such as when a facilitator must consciously "step out" of a facilitative role in order to address a subject matter issue: "When leaders or members do choose to both facilitate and participate, they need to keep the two roles separate. They need to signal in some way (e.g. sitting down in an empty chair) that they are stepping out of the facilitator role and into the role of group participant and vice versa" (1993: 160).

Practitioner aesthetics are generally not addressed except in an indirect manner, such as how facilitators "design" a meeting (Bostrom et al., 1993: 160). Facilitator sensemaking, similarly, is indirectly addressed, such as discussions of the "counteractive influence" facilitators can have as they adjust and adapt their interventions in a meeting, for example to deal with a disruptive interaction among participants (Bostrom et al., 1993: 161-162). Clawson & Bostrom (1996) discuss issues faced by new facilitators that touch on sensemaking and related phenomena: "understanding one's own facilitation actions, intended or unintended, is possible only with attention to situational and contextual cues." Yoong cites Ackermann (1996: 110) in recognizing that each facilitative intervention is unique, and that as a result, facilitators are required to behave in a contingent manner, rather than following prescribed formulas" (Yoong, 1999: 87).

Some GSS research directly addresses the unique considerations that the technology itself adds to the facilitation, for example in distinguishing between roles such as "technical facilitator," "technographer," and "process facilitator" (Bostrom et al., 1993: 159). Technology skills must be a part of the GSS facilitator's skill set: "any facilitator who lacks the knowledge of and comfort with a GSS will have a difficult time selecting appropriate structures and guiding the appropriation process" (Bostrom et al., 1993: 163). Yoong applied a reflective practice approach to GSS facilitators learning how to make the transition from conventional facilitation to electronic GSS facilitation (1999: 105-106).

### 3.4.4 Summary

This section discussed where and how the facilitation and mediation research literature addresses practitioner experience. Much of the mainstream research in this area emphasizes functionalist approaches, focusing on tools, methods, and outcomes. Facilitative aesthetics, such as the crafting and shaping of mediating representations, receives little attention, and there has been only indirect attention to facilitative sensemaking. Although GSS research examines the ways that facilitation combines with software use, there has not been research on the active engagement of facilitators with software tools as expressive media (as opposed to automation of decision-making and note-taking processes). While concerns about ethics have received broad attention, other experiential factors are less discussed. However, many researchers have called for increased attention to such matters, particularly with regard to reflective approaches to training and professional development, recognizing that effective facilitators and mediators require many and diverse skills. The following section touches on many of the same themes.

## 3.5 Art-making as social or professional applied practice

This section examines professional practices in which aesthetics are viewed as integral to the way the practices are performed, including documentary filmmaking, website design, improvisational and political theater, narrative therapy, and aesthetic mediation. Research in this domain, where goals

and techniques traditionally in the province of the arts meet those of traditionally more instrumental pursuits, often reflects a synthesis of ethics and aesthetics. DiSalvo et al. point out that "ethics and responsibility" are "issues artists have tended to eschew," but that now require attention for artists attempting to do "dialogic work" in communities (2009: 392). Arts-based methods are increasingly seen in various management and organizational development practices and are regarded as ways to trigger creativity, courage, and intuition (Taylor & Ladkin, 2009: 56). As with research in participatory design, facilitation, and mediation, much research in this area is critiqued for an excessive focus on tools and mechanisms but not how things actually happen: "Many of the accounts focus on the actual methods and their results with little exploration of the underlying mechanisms by which these outcomes occur" (Taylor & Ladkin, 2009: 57). Some researchers are actively engaged in moving from the "intellectual theorizing" of focusing on outcomes, to the "aesthetic theorizing" of "focus on process" (Hansen et al., 2007).

### 3.5.1 Aesthetic mediation and social action

Professional practices that use aesthetic means to provide assistance to an underprivileged group are particularly dramatic instances of the intentional combination of aesthetics and ethics. Salverson (2001) examines the ethical subtleties of the role of a theater practitioner who works with various disadvantaged groups, such as political refugees, attempting to "give voice" to their concerns in a theatrical setting. This work, which draws heavily on the work of Augusto Boal (1979), is explicitly transformative in its orientation – that is, it seeks to bring about a positive change in the social situation. Much of Salverson's analysis treats ethical questions directly, particularly those that have to do with practitioner self-conception and stance towards participants and audiences. These are manifested in practices as diverse as scriptwriting, rehearsal procedures, and public performances. Her thesis is that neither holding a positive social agenda nor being proficient at the practice is ethically sufficient. Rather, staying present to the particular situation and the relationship of participants to each other is an ongoing ethical imperative, to avoid doing any further damage to already injured parties. She asks:

> What is my part in this work, this forming of accounts of lives into testimony, into performance, and what does it mean to me? If as an artist and educator I presume to talk about the ethical relation, I must consider the kind of person I am or may become, the me exposed, the me available to another (2001: 11).

Alexander (2010) reports on twenty years of engaging university students and prison inmates in poetry, theater, and arts projects in Michigan prisons. His book on the Prison Creative Arts Project examines the successes and pitfalls in facilitator training. It describes the multiple and sometimes conflicting responsibilities of facilitators to officials, inmates, guards, university administrators, and students, and contains examples of the ways both student and faculty (as well as inmate) facilitators encountered dilemmas and crises on many levels. These often required improvisation, sensemaking, reflection, and re-evaluation of the ways the goals, aesthetics, and ethics of the program should be related.

This theme is carried into the work of other researchers and practitioners in the area of aesthetic mediation, which uses art practices in dispute or conflict situations to attempt to achieve reconciliation between the parties. Cohen examines practices in these often extremely sensitive efforts (for example, in story-telling, theater, and collage-making workshops with groups of Israeli and Palestinian women). In such contexts, the ethical consequences of practitioner efforts stand out in sharp relief:

> Those who participate in and/or facilitate reconciliation processes must contend with seemingly contradictory imperatives towards means and ends, justice and mercy, attention to individual and systemic change, empowerment and interdependence. Competing and even contradictory narratives lay claim to legitimacy, often with equally compelling vibrancy. The ability to maneuver within the realm of paradox and ambiguity is central to the educational work of reconciliation (Cohen, 1997: 167).

Part of the crafting of the form and the related processes include minimizing the ethical risks (Cohen, 1997: 320). This can be seen in Lovelace's (2001) description of the responsibilities of mediators using story-telling techniques. This approach posits that a cornerstone of successful mediation is facilitating "the production of a coherent narrative" (Lovelace, 2001). Rather than focusing on the opposing sides of a dispute, narrative mediators focus on stories. The mediator's role becomes one of "active participant in the co-construction of the narrative" (Lovelace, 2001). This approach, also based in Boal, builds participants' capacities to define the issues in the dispute and freshly conceive of possible outcomes.

### 3.5.2 Media practices

Reflective and ethical approaches to media production can also pay direct attention to the aesthetic shaping of the media artifacts. Voithofer (2000) examines his own experience as a web designer creating a website for cancer patients. He traces the evolution of the site from conception through implementation and ongoing changes, analyzing his interactions with a community of cancer sufferers as well as the impacts of his own technical and aesthetic choices. Throughout, he maintains an ethical stance of trying to understand what actions he could take that would be helpful to the community, his efforts to increase their level of engagement with the website, and his partial failures and successes in achieving the social goals he had set, as expressed both in his design of the site and the communication about it with its intended beneficiaries.

Dowmunt's paper on autobiographic documentary video-making addresses ethical issues. He asks, "Why look at autobiographical filmmaking as a practice/research project" and answers:

> The significant degree to which problems – ethical, aesthetic, and epistemological – derive from the address of documentary work… the subjects of documentary …are necessarily subject to a degree of objectification – of 'othering'. (Dowmunt, 2003)

Ellis's paper on the broadcast industry (2003) calls for close critical research and reflection for both industry practitioners and academic researchers, looking at both "critical reflection on practice

within the industry and the academy" and to develop "means of assessing research aimed at changing production practices rather than products (e.g. 'more ethical' ways of making documentary)." Wright & McCarthy describe Raijmakers et al.'s work (2006) in creating documentaries aimed at provoking insight and creativity in professional designers through empathic portraits of "the everyday lives of people" (2008: 643).

### 3.5.3 Pedagogical practices

Some educational researchers apply a range of aesthetic and ethical factors in their critical analyses of pedagogical practices and teaching. For example, Voithofer explores how instructional design practices "often allude to the artistic aspects of instructional design, however they do not articulate how this occurs, in part because it is an indefinable, unpredictable, unrepeatable and uncontainable part of the process" (Voithofer, 2000). Ellsworth (1992) explores similar ground in an article describing her attempt to use "liberation pedagogy" as part of her practice as an educator of undergraduates at the University of Wisconsin, tracing how choices in curriculum design and classroom interactions with students align or conflict with her ethical aims. In his exploration of an aesthetics-based approach to pedagogy named "enquiry-based learning," Small (2009) makes a connection between aesthetics and ethics where they meet in communication, analyzing the responsibility of practitioners to examine their relationships to representations and participants:

> We might accept that a clearer understanding of the creative process would help us to get better at it, particularly if we were involved in communicating about our art, in teaching or being taught, for example. We might agree that it is the responsibility of all art with a communicative purpose to be self-referencing to a degree — even if only in stating its relation to its frame or context — and that that is what makes a work an objective entity, gives it its 'comprehensive unity' (2009: 262).

Involvement with a representation moves between practical or instrumental considerations ("efferent") and more experiential, "felt" or aesthetic poles (Small, 2009: 255). Citing Rosenblatt

(1985), Small states that pedagogical practitioners attempting to include aesthetic experience must recognize a continuum of experience "between the aesthetic and the efferent poles … there is a to and fro movement of attention between the words and the experienced, felt meaning being elicited, organised and reorganised" (2009: 255). Felsa & Meyera (1997) describe an approach to teacher education for classroom science teaching called "performative inquiry," in which teachers create plays as a way of better understanding and "living" science education (e.g. physics), drawing connections between teacher sensemaking and the experience of making and performing the plays (1997: 75).

Many researchers relate aesthetic engagement to Csikszentmihalyi's concept of flow (1975, 1991). Invoking terms such as engrossing, motivating, involving, and enthralling in the context of "the new literacy classroom," Kist proposes that representations can be motivating and involving to students. He notes that flow is aligned with engagement and peak experience – "engrossed and involved with the task at hand" (2000: 235).

### 3.5.4 Organizational learning and consulting practices

A variety of practices involve the use of art and art-based methods to help organizations effect change. Taylor & Ladkin (2009) find a rich variety of art-based methods in use for management and leadership development, giving examples such as:

> medical residents are taught theater skills to increase their clinical empathy … managers build 3-dimensional representations of their organizational strategy using LEGO bricks …U.S. Army leaders look to the film *Twelve O'Clock High* to illustrate key lessons about leadership … MBA students at Babson College take art classes to enhance their creativity (2009: 55).

Researchers in this area examine how incorporating aesthetic approaches differentiates the practices from conventional ones, examining the roles that representations play, and how facilitative interventions in such contexts are both different from and similar to conventional facilitation.

Salas et al. (2007) developed a methodology called “Visualisation in Participatory Programmes” to use participatory visual representations in international development programs, developing a training curriculum that combined skills with the visual materials (cards, charts, diagrams, and drawings) with group process, cognitive, and emotional skills. Nissley (1999) used a wide variety of art practices in organizational change settings (theater, stained glass making, and music among others). He used these experiences to develop an epistemology of “aesthetic ways of knowing in organizational life” (Palus & Horth, 2005). Orr (2003) developed and tested a “process in which artistic media are used to engage organizational members in collaborative learning, sensemaking and change,” which she named “aesthetic practice.” Palus & Horth (2005) describe six types of “aesthetic competencies” discerned among participants in their work incorporating art-making in leadership development workshops. Taylor & Ladkin explore similar approaches, noting that facilitators have to go beyond the technique itself to make it work and need backgrounds in both art and organizational development so that participants will be able to translate their experiences back to the workplace (2009:  66).

Some organizational learning practitioners use narrative as an intentional strategy to promote participant self-understanding, as in assigning managers to write autobiographies: “They directly transform the author into both writer and reader of his or her own life, and in so doing it allows him or her to learn from his or her own experiences” (Alvarez & Merchan, 1992).

“Stories” as objects used in such activities as “learning” is a subject well covered in the knowledge management (KM) literature, although not often from the perspective of narrative theory. KM researchers speak of stories as a principal method of “knowledge transfer” and repository of organizational meaning and memory, describing “organizations as storytelling systems” (Boje, 1991), and storytelling as “the preferred sense-making currency of human relationships among internal and external stakeholders.” Hansen et al. (2007) analyzed an effort where they as practitioners

attempted to create a collective story, reporting the choices and ethics that emerged and the realization of consequences in the interplay of process and product:

> We found that writing our story in a collective manner locked us into a pattern of forward movement that closed as many avenues as it opened. The many opportunities to take the story in a given direction quickly appeared and disappeared … Whenever someone introduced a twist of events that completely upended what we thought was happening, we were compelled to reconsider our prior assumptions (2007: 121-122).

Reflecting on the implications of their experience, they assert that such approaches may assist organizations in creating more democratic change process, speculating that it might be a way to avoid the "storying in" of less empowered voices (2007: 123-4). In Sawyer's (2001) analysis of improvisational theater, he gives the "no denial" rule as an example of an (implicitly) ethical stance on the part of the performers:

> The single most important rule of improv is "Yes, and." In every line of dialogue, an actor should do two things: Accept the material introduced in the prior line, and add something new to the emerging drama. Everything that is introduced by an actor must be fully embraced and accepted by the other actors on stage. To deny a fellow actor is to reject whatever he has just introduced into the dialogue, and denial stops a scene dead.

Management consultancies have begun to incorporate the "yes, and" construct in brainstorming work with their clients (Segal, 2010). Taylor & Ladkin note the concept has appeared in studies of collaboration in software development (2009: 57).

Practitioners of graphic facilitation create murals in live performance in front of clients, sometimes involving direct participation. Tyler et al. (2005) describe an eleven-day conference on interfaith dialogue in which ten graphic facilitators worked with over four hundred participants in multiple sessions. They report on the need to make aesthetic choices about how to shape the representation

in response to group needs, emphasizing the need for flexibility given the broad scope and fast pace of the event (2005: 142). A special concern was encouraging participation in the crafting of the images, such as "asking participants to come up and draw their own stories, add words/meaning in their own languages to existing graphics, or give additional stories and designs to the graphic facilitator to draw" (2005: 142-144).

### 3.5.5 Artistic performance and exhibition

Sawyer argues that Sufi improvisational singers construing themselves as "vessels" rather than creative artists in their own right, "evoking" rather than "expressing" artistic intent, take an implicit ethical stance (1996). The singers define their relationship to the social (as well as spiritual) context of their practice – that of the participants (audience). In other words, their ostensibly "aesthetic" actions (singing) have an implicitly social purpose. Sawyer's analyses of improvisational actors and musicians show that there are effects on audiences (as well as other performers) in every such performance. Echoing Salverson (2001), he implies that performers need to be conscious of these dimensions: "The cultural function of all performances, both ritualized and improvised, includes a desired effect on the audience members" (Sawyer, 1996: 286).

Edmonds et al. (2006) report on efforts to create public engagement with interactive artworks at a museum in Sydney. They note that practitioners of interactive participatory art need to think about how to enable engagement and sustain audience interest in order to make interaction meaningful (2006: 309). They find a notion of "situated interactivity" in Suchman (1987: 50), defining this as "a notion of interactivity in which action is central and goals are emergent … the significance of artefacts and actions, and the methods by which their significance is conveyed, have an essential relationship to their particular, concrete circumstances" (2006: 311-312).

### 3.5.6 Summary

While some research in the area of arts-based methods falls into rationalist and functionalist discussions of tools, methods, and outcomes, there is much work that speaks directly to the

confluence of experiential dimensions discussed in Chapter 2. Researchers such as Salverson, Alexander, Cohen, and others regard the aesthetic and ethical aspects of their work as inseparable and intertwined. Such research recognizes the ineffable aspects (Boehner et al., 2008) of practitioner experience when attempting to combine aesthetic approaches with providing a facilitative service, and many discuss the multifaceted nature of the skills required to perform the practices. Arts-based methods are not yet a bounded research discipline with a coherent focus, and there is little work that looks at explicitly facilitative practices involving software tools used as representational media.

## 3.6 Chapter summary

This chapter traces the concepts discussed in Chapter 2 through related research in computing, facilitation and mediation, participatory design, art-based practices, and practitioner studies, noting both the presence and absence of the concepts in the literature. The related work presented many configurations of literature on practitioner experience, aesthetics, narrative, improvisation, sensemaking, and ethics, seen both in their presence as well as their absence, describing how the various literatures address topics like the role of visual representations, the nature of engagement with such representations, the importance of situation and context, the need for a research focus on the move-by-move level, and the limitations of practice research focused mainly on tools, methods, and outcomes. While there is much of value in this related work for the central concerns of this thesis, none treats the specific intersection of facilitative and participatory concerns, software tools, aesthetic factors of representations, and improvisational actions that the remainder of the thesis will describe.

The next chapter describes the methods used to discover and illuminate how the concepts discussed in Chapters 2 and 3 manifest themselves in instances of participatory representational practice.

# 4 Methods

This chapter describes the techniques and process used to analyze the ways in which the dimensions discussed in Chapter 2 play out in practice situations. The main areas of focus are:

- General principles of qualitative research that guided the methods used in this thesis
- Iterative development of observational analysis techniques drawing on qualitative research and grounded theory methods
- Selection of practitioners to study – the sessions and their settings
- Sampling and practitioner diversity
- The practice task given to non-expert practitioners
- Detailed descriptions of the individual analysis techniques
- The comparative analysis approach

## 4.1 General principles

As befitting exploratory work in an under-researched domain, this research used qualitative research techniques to identify themes and hypotheses through close analysis of video and screen recordings of participatory knowledge mapping sessions. Qualitative approaches, such as grounded theory (Strauss & Corbin, 1990), are generally regarded as appropriate when a field or phenomenon is in its early stages, and when research problems and theoretical issues are not yet well defined. In addition, many of the considerations that the studied practitioners encountered were emergent in character, responding to the unexpected events and anomalies that intruded on even the most carefully planned sessions. Indeed, sensemaking considerations form the core of the analysis here, since being able to resolve the anomalies they encounter was a key success factor for the practitioners. The ability to diagnose and repair breakdowns by drawing on a pre-existing "repertoire of expectations, images, and techniques" (Schön,

1983: 60), as well as fresh creative responses in a near instantaneous fashion, is the hallmark of successful professionals of many kinds and is no less the case for the practitioners in this study.

Characterizing the aesthetics and ethics of participatory representational practitioners is largely uncharted territory from a research point of view. As a principal goal of this research, exploring and "naming" this territory requires research methods that suit such an approach rather than those that proceed from well-formed, falsifiable hypotheses. This section provides a general justification of the research methods in this thesis. Its central themes are:

- the methods need to suit an emergent, inductive exploration of a phenomenon
- the need to study practice in situated contexts
- the need to triangulate among data gathered via different techniques

### 4.1.1 Studying practitioners

Various researchers stress the importance of looking at both macro and micro levels in studying the skills and knowledge of professional practitioners, recommending *in situ* analysis (e.g. Petre, 2003). Activity theorists prescribe understanding practitioner subjectivity by locating it in its surrounding social context (Dreir, 1993). Sawyer advocates placing individual interactional moves as the focus of analysis, making them the entity that is related to the surrounding social context (per the socioculturalist agenda), especially when studying improvisation (Sawyer, 1999).

Schön prescribes "repertoire-building" research, aimed at deepened understanding of practitioner expertise and agency by examining specific case histories to go beyond observable actions, outcomes, and context. It aims to show how a practitioner's "path of inquiry" evolved over the course of a project or intervention (Schön, 1983: 317).

Qualitative research methods provide a variety of techniques for addressing contextual, phenomenological, and interactional factors, particularly when what is required is "exploring uncharted territory," which certainly appears to be the case for participatory representational practice involving hypermedia. It is most appropriate when building new theory, where

interpretation and subjective factors rather than quantification of objective observables is called for, along with “an orientation towards process rather than outcome” and “a concern with context regarding behavior and situation as inextricably linked in forming experience” (Sankaran, 2001). Qualitative approaches have been widely applied to studying professional practices like facilitation and mediation, whose study combines observable with subjective and phenomenological considerations (e.g. Stewart, 2006; Lundberg & Arvola, 2007; Wagenaar & Hulsebosch, 2008; Thomas, 2008; Wardale, 2008; Kolbe & Boos, 2009; Shaw et al., 2010). Stewart argues that qualitative research into facilitation is necessary to achieve "contextual realism" (2006: 424).

The task of a qualitative researcher is to “enter the situation so deeply that they can recreate in imagination and experience the thoughts and sentiments of the observed” (Christians & Carey, 1981: 347). This is in order to better understand the “meanings that people use to guide their activities.” Qualitative research is particularly suited to areas of study where understanding “the nature of persons’ experience with a phenomenon” is a central focus, especially when the phenomenon is not yet well understood (Strauss & Corbin, 1990: 19). Such research, since it examines little-understood phenomena, often must start with “fuzzy questions” (Dick, 1993) for which initial answers and even method choice will also be “fuzzy.”

Advocates for qualitative approaches stress the different emphases and “affordances” of qualitative modes of inquiry as against quantitative approaches. Marshall & Newton echo Schön’s position in this:

> The kinds of problems scientific inquiry has most difficulty in exposing are precisely the kinds of problems and situations faced by practitioners: problems and situations that are complex, uncertain, unstable, and unique, often articulated across conflicting value systems. The kinds of solutions offered through scientific inquiry (descriptive generalizations) have little relevance back to the situations of practice. (2000: no page number)

Validity is as key a concern in qualitative research as quantitative, but it can take different forms. *Contextual* validity ("how well a piece of data fits with the rest of the data obtained" (Holian, 1999)) takes precedence over *external* validity (being able to generalize observed cause and effect within the study to "other persons, places or times" (Trochim, 2006). Holian (1999) defines *catalytic* validity as relating to "emerging possibilities" and cites Reason and Rowan as defining validity "as that which is 'not only right but useful or illuminating to the actors'." She goes on to link qualitative validity to the methodological technique of triangulation: a "combination of aspects of the presented world, the posited world and the researched world."

Sections 4.1.1.1 through 4.1.1.5 describe five qualitative research techniques employed in this thesis that build on the above concepts.

#### 4.1.1.1 Grounded theory

Grounded theory prescribes a set of techniques for deriving a framework of concepts from data gathered through participant observation and other methods, emphasizing the process of data-driven inductive reasoning in a "constant interplay between proposing and checking" (Strauss & Corbin, 1990: 111):

> A grounded theory is one that is inductively derived from the study of the phenomenon it represents… one begins with an area of study and what is relevant to that area is allowed to emerge. (Strauss & Corbin, 1990: 23)

Grounded theory emphasizes working from close observation of the data to extract categories, concepts, and properties, first in a process of "open" coding in which the categories, properties, and dimensions are identified, and "events/actions/interactions are compared with others for similarities and differences" and assigned "conceptual labels" (Corbin & Strauss, 1990: 12), then connecting them together in a process of "axial" coding, in which "categories are related to their subcategories, and the relationships tested against data" (Corbin & Strauss, 1990: 13). Finally, through the process

of “selective coding,” a core category is identified and the other categories related to it, fitting the overall into a “story line” (Strauss & Corbin, 1990). The approach also stresses the importance of iterative refinement of categories, theory, and story line based on repeated rounds of revisiting the data.

Orlikowski (1993) used grounded theory in her analysis of technology-use mediation, while Yoong & Gallupe (2002) employed the approach in their study of GSS facilitators. Orr (2003) used it in her study of aesthetic mediation in organizations. In this thesis, grounded theory was used throughout the development and application of the individual and comparative session analyses. Yoong argues that a grounded theory approach is especially indicated when there is “little previous research on this topic" and when "focus on processual analysis" (referring to "human experience, interaction and change in a group setting") is desired, seeking “to understand the context in which these processes occurred” (1999: 89-90). The approach is especially indicated when the aim is to come up with descriptive categories grounded in the setting, rather than determined a priori.

#### 4.1.1.2 Transcript analysis

Transcript analysis involves the study of verbatim transcriptions of events, for example mediation or facilitation sessions. Transcripts provide a rich data source to discern and examine each practitioner move and the engagement of participants with each other, the practitioner, and (to varying degrees) any mediating representation. This technique is employed by Jacobs (2002), Jacobs & Aakhus (2002), Aakhus (2003), and Bush & Folger (1994) in their close analyses of dispute mediator moves in a variety of contexts. Yoong & Gallupe (2002) used transcript analysis in their study of GSS facilitators, as did Kolbe & Boos in their study of facilitator subjectivity (2009) and Shaw et al. (2010) in their study of facilitator impact during a quality improvement process. Forlizzi & Battarbee (2004) recommend such analysis in analyzing experience in HCI, while Sosa advocates its use in studying designer creativity (1999). Lundberg & Arvola use the approach in facilitation of participatory design sessions (2007). Distributed cognition (e.g. Hollan et al., 2002) and other ethnographic studies of

work (e.g. Blomberg et al., 1993) stress the importance of transcripts from audio and video recordings of practice.

In this thesis, analysis of all sessions began by creating a transcript. Grid analyses, which are enhanced transcripts, add practitioner moves on the representation along with other aspects and dimensions (see section 4.6.4).

#### 4.1.1.3 Critical incident analysis

Critical incident analysis highlights particular events that "stand out" from a larger situation in some way, as in this example from education:

> A critical incident may be a commonplace, everyday event or interaction, but it is "critical" in that it stands out for you. Perhaps it was problematic, confusing, a great success, a terrible failure, or captures the essence of what you are trying to achieve in teaching and learning (Tripp, 1993).

The technique is used widely in both training and research contexts. Selecting incidents to focus on requires careful consideration. According to Fountain (1999), "Incidents typically include three features: a description of the situation, an account of the actions or behavior of the key player in the incident, and the outcome or result. Incidents are typically reported as examples of "effective" or "ineffective" actions."

Clawson (1992) and others have used critical incident analysis to study GSS facilitators, as do Forlizzi & Battarbee (2004) in the HCI context. In this thesis, critical incident analysis was used to select sensemaking moments, akin to how Dervin (1997) identifies such moments as part of her micro-moment time-line interviewing instruments. In this thesis, sensemaking moments were regarded as critical incidents and selected for closer analysis. Yoong advocates using critical incidents in GSS facilitation training (1999:105).

#### 4.1.1.4 Taxonomy development

A key goal of qualitative research in general, and grounded theory in particular, is to create and refine taxonomical understandings of phenomena. Christians & Carey speak of the "general task of qualitative studies – to make us aware of the categories in which we think and to analyze and critique such models" (Christians & Carey, 1981: 346). This requires deep immersion in the situations of practice under study. A key consideration becomes separating the "wheat" from the "chaff" – the voluminous data produced by such immersion, which requires "exegetic" skills, such as "reading situations or documents with grammatical precision," and avoiding "blurred grammatical categories" (Fortner & Christians, 1981: 366).

Kolbe & Boos (2009) developed a taxonomy of concepts to understand group facilitators' concepts of subjective coordination, using grounded theory. The methods described in this chapter lead toward the preliminary taxonomy of concepts with which to describe participatory representational practice presented in Chapters 6 through 8.

#### 4.1.1.5 Triangulation

A central concept in qualitative research is *triangulation* – the use of multiple methods, each with different data collection techniques and analysis strategies, in order to examine a phenomenon from multiple perspectives. Triangulation can take many forms and emphasizes that employing multiple methods can "avoid the personal bias and superficiality that stem from one narrow probe" (Fortner & Christians, 1981). Researchers should mobilize all relevant and practical techniques, using both qualitative and quantitative methods as appropriate (Levina, 2001). The same emphasis, referred to as "dialectic," is found in Dick's guidelines for action research (1993).

Examples of triangulation can be found in many studies with similar approaches to this thesis. For example, Aakhus triangulates between grounded theory, individual interviews, participant observation, and focus groups in his study of GDSS facilitators (2001). Graham (1997), in her study of both the making of and the museum-goer response to computer-based interactive artwork, argues

that “hybrid media require hybrid analysis” and triangulates between observation, art practice, and curation studies. Yoong & Gallupe (2002) triangulated among “semi-structured interviews, participant observation, personal journals, and video recordings” in their study of GSS facilitators, observing that they were “thus provided with a collection of diverse ‘slices of data’ that enhanced the use of the constant comparative method.” Bansler & Havn (2006) employ triangulation in their study of sensemaking in technology-use mediation.

In this thesis, five different individual analytic tools were applied to each of the eight studied sessions, along with a questionnaire completed by the studied practitioners. As explained in section 4.2 and expanded on in section 4.64.6, development of the tools themselves had a cyclic, emergent nature, proceeding in part as a result of uncovering areas where triangulation would be helpful (that is, where one or more of the existing tools did not cover all the areas and facets of the phenomenon). The qualitative tools were supplemented by quantitative analysis from questionnaire data, which combined demographic factors with skill, knowledge, and experience profiles for the studied practitioners (section 4.4.1). Although the sample was limited in size, multiple settings, tasks, and practitioner skill levels were chosen for study to allow for the different analyses to be tested and compared with some level of diversity (section 4.3). Finally, the results of all of the methods were extensively triangulated during the comparative analysis, as will be discussed in section 4.7.

#### 4.1.1.6 Summary

This section has highlighted qualitative research methods and concepts employed in this thesis. The next section expands on one of these themes, the iterative development of methods used in this research.

## 4.2 Iterative development of methods and analysis approach

As discussed in section 4.1, qualitative research often relies on *iteration*, where rounds of analysis of specific cases alternate with reflection on what the analysis has shown, its limitations, and needs for expanding or altering samples, cases, or methods (Cohen & Crabtree, 2006). Qualitative

methodologists argue that iterative approaches are “key to sparking insight and developing meaning” (Srivastava & Hopwood, 2009: 76). Such iteration is central to approaches like cognitive ethnography, which stresses the “loop from observation to theory to design and back to new ethnographic observations” (Hollan et al., 2000: 183). Reporting on how the iterations led to refinement of approach is central to the evaluation of qualitative research, wherein reviewers seek to understand the researcher’s *reflexivity*, the ways they interpreted and applied insights and challenges from repeated rounds of analysis and reflection (Stenius et al., 2004: 87). A well-formed qualitative study should provide a clear understanding of the choices made along the way and how they led to formulation of the research questions, site and sample selection, development of methods, and preparation of findings (Chenail, 1995).

Many qualitative researchers emphasize the cyclic or spiral nature of the approach, whereby increasingly precise and “sensitive” concepts emerge over time through repeated rounds of the cycle (Christians & Carey, 1981: 359). Approaches such as action research recommend an intentionally cyclic approach, continually raising, clarifying, and challenging emergent meanings and interpretations, comprising not only data analysis but literature review and theory development (Dick, 1993). Stewart employed an iterative approach in her study of facilitator competency, noting that the research design changed over time “due to the emergence of themes and issues of access, which is to be expected with a qualitative approach." (2006: 425). Bansler & Havn report using an iterative approach “in a process of recursive scrutiny to get as complete a picture as possible,” including repeated rounds of not only data analysis but also theoretical review. They note that “in interpreting our data we constantly referred to relevant bodies of research on technology adaptation, sensemaking, and CSCW. Thus, the processes of reporting the findings and conducting the analysis were highly connected and interwoven” (2006: 66-67).

Sections 4.2.1 through 4.2.3 describe the way that analytical methods, theoretical frameworks, and results from their application to instances of actual practice evolved over the course of the research

described in this thesis. There were three main rounds of iteration. The rounds are described at a high level, followed by descriptions of steps within the rounds that led to the final approaches in Round 3.

### 4.2.1 Three stages of iteration

Figure 4.1 summarizes the iterative development of analytical tools and their application for this thesis. The major activities are shown in circles, with the key challenges and gaps leading to a new iteration shown as rectangles.

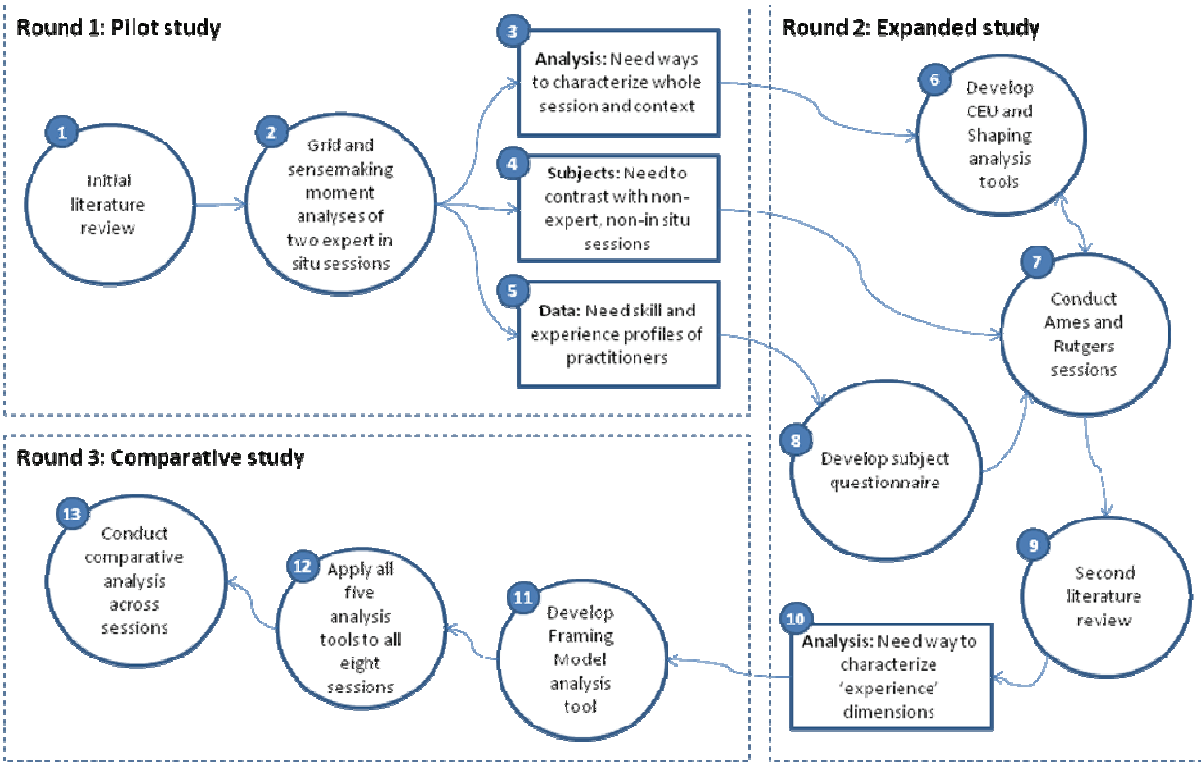



**Figure 4.1: Stages in the iterative development of methods**

As depicted in Figure 4.1, the research described in this thesis proceeded in three main rounds:

- **Round 1: Pilot study**. The research began by conducting a literature review (**1**) and analyzing two instances of expert practice on an *in situ* project (the Mobile Agents effort in 2004)(**2**). Initial theory-building focused on locating practitioner aesthetics, ethics, improvisation, narrative, and sensemaking in related literature. This round comprised the selection of the two instances, development of the "Grid" analysis (see section 4.6.4) and narrative

description of selected sensemaking moments in the episodes through repeated rounds of viewing the subject videos, deriving categories and dimensions that could be applied to each individual practitioner and participant move throughout the session, writing up the results, and a round of review and reflection that led to realizations that a larger grainsize of analysis was needed (**3**). The studied sessions, though producing a wealth of insight, had several issues that required broadening the base of studied practitioners (**4**), and additional "demographic" data was needed about the studied practitioners (**5**). Round 1 occurred between October 2003 and October 2005, culminating in the First Year Report

- **Round 2**: **Expanded study**. Round 2 began with several streams of activity. To address the need for a larger grainsize of analysis to complement the move-by-move work done in Round 1, two new analysis tools (the "CEU" and "Shaping form" analyses; see sections 4.6.2 and 4.6.1) were developed (**6**). To be able to contrast expert with non-expert practice and to broaden the diversity of studied practitioners, two new research locales were identified and sessions held and recorded (**7**), necessitating the development of a questionnaire instrument to be able to classify and categorize the skill and experience characteristics of the studied practitioners (**8**). A second literature review was conducted that focused on "experience" as a framing construct (**9**). This led to a realization that an additional analysis tool was needed to characterize the sessions according to the components of a "Framing" model (see section 4.6.5) of practitioner experience (**10**). Round 2 activities occurred between November 2005 and October 2007

- **Round 3**: **Comparative study**. The final round focused on further analysis of all studied sessions and practitioners, first analyzed as individual events and then compared to one another. The additional "Framing" analysis tool was developed (**11**) and, along with the already existing four analysis tools, applied to all eight of the studied sessions (**12**). Finally, comparative analysis of all the artifacts, including the output from the 40 individual analysis

documents and the questionnaire results, was conducted using both grounded theory and quantitative techniques (**13**). Round 3 activities occurred between November 2007 and April 2010

### 4.2.2 Moving from Round 1 to Round 2

#### 4.2.2.1 Approach for Round 1

Round 1 concentrated on individual moves by expert practitioners, analyzing two sessions from the Mobile Agents project (see section 4.3.1). The primary analytical tool was the Grid analysis, a fine-grained instrument with a number of categories derived from open and axial coding on the contextual meaning of each move and statement in a session, refined through repeated passes through the data. The tool is further described in section 4.6.4.

Sensemaking triggers were identified in both sessions, moments where something disturbed the expected flow of events and forced the practitioner to do something different, often requiring creative improvisation to resolve the episode and return the session to its intended track. After completing the Grid analysis, narrative descriptions of the sensemaking episodes were prepared. These started by describing the sensemaking trigger, followed by descriptions of the actions within the episode, then by explaining how the episode was brought to closure. The narrative descriptions are further described in section 4.6.3.

#### 4.2.2.2 Limitations from Round 1

While the Round 1 approach produced a large amount of richly described data, several limitations became apparent. First, it was extremely time-consuming to apply the 18 analytical categories to each move and statement of a 2-hour session, which might contain over 1,300 moves and statements. A Grid analysis of a single 2h15m session required almost 24,000 cells in a spreadsheet. Second, important aspects of the context itself seemed to recede when the analysis focused mainly on individual moves. Without losing the focus on the meaning of individual moves, there needed to

be a way to frame those moves that could more clearly connect them to their context, especially in ways facilitating the identification of the aesthetic and ethical dimensions informing the moves.

Further limitations and issues from Round 1 called for refinement or expansion of the approach, some brought about by reviewer comments from the First Year Report and other publications:

- The two Mobile Agents practitioners were already at such an expert level that it was difficult for some readers to discern the meaning of moves, since their skill level made them appear (in reviewer's words) "natural" or "magic"

- The sample size was too small (two practitioners)

- The events studied were part of larger projects and required a great deal of contextual information for the reader to understand what was going on, and to infer the meaning of the sensemaking moves in the context

- Focusing on the practitioner alone seemed to obscure, to some degree, the role of participants in the shaping of the representations

- The practitioners studied were close colleagues of the researcher, leading to comments about possible bias or blinders

These realizations led to the Round 2 development of two further analytical tools, an expansion of the types of practitioner studied and the settings for their practice, and an expansion of the kind of data collected.

#### 4.2.2.3 New analytical tools for Round 2

The first, called the Shaping form (section 4.6.1) provided a way to characterize the aesthetic "shaping" that both was intended (planned) and actually occurred during a session. The second, named the CEU analysis (section 4.6.2), was a distillation of the more fine-grained concepts and categories from the Grid analysis, allowing the characterization of broader timeslots in a session with a more manageable set of three criteria derived from the open and axial coding. Both of these processes provided the means to frame the episodes covered in the other analyses in the context of the session as a whole, in such a way as to highlight the dimensions of interest at various levels of granularity (session, timeslot, and move).

#### 4.2.2.4 New settings, tasks, and practitioner types for Round 2

To develop effective comparisons and categorizations of practice required expansion of the studied practitioners beyond Round 1's limited practitioner set. The expanded practitioner pool needed the following characteristics:

- Practitioners at varying levels of expertise, including relative novices

- Multiple practitioners, to get a wider base of comparison, including people working together (e.g. as "facilitator" and "mapper") rather than as a "magic" solo practitioner

- A defined, contextually bounded task that could be easily explained and was consistent from practitioner to practitioner, and that was short enough so that the entire session could be analyzed and compared

- The ability to look at the role of participants in the shaping of the artifacts, not focusing solely on practitioners alone. The intent was to move towards shaping as a primary

focus, looking at how individual and collaborative shaping intersect, and in what ways

- The studied practitioners were not colleagues of the researcher

These considerations led to the establishment of the Ames and Rutgers sessions in 2007, with populations of relatively novice practitioners, none of whom were colleagues of the researcher, given a consistent task to perform within a tightly constrained timeframe to facilitate comparisons, and a greater emphasis on participant involvement in shaping and other session activities. The Ames and Rutgers settings are described in sections 4.3.2 and 4.3.3. The approach to establishing the diversity of the studied practitioners is described in section 4.4. The practice task is described in section 4.5.

### 4.2.3 Moving from Round 2 to Round 3

A further round of literature review and theory-building followed the sessions in Round 2. When complete, it was apparent that there needed to be a way to connect the results of the individual session analyses more explicitly to the dimensions of the theoretical framework, particularly considerations of "experience" as a framing construct (see sections 2.2.1.2 and 3.1.1). This led to the development of the Framing analysis tool (see section 4.6.5). Its categories and questions are derived from the conceptual framework, conceived as an ideal, normative model for how a practitioner should act in a practice situation, allowing comparisons of what actually happened in a session to an ideal model, so as to highlight how practitioner choices moved either closer or farther away from ideal behavior.

Applying all of the methods to each of the eight individual sessions, including applying the Round 2 methods to the Round 1 sessions, allowed for the culminating activity of comparative analysis. The approach for this analysis is described in section 4.7. Its results constitute the bulk of the findings presented in Chapter 6 through 8. Section 8.3 reflects on the methods in light of these findings.

## 4.3 The sessions and their settings

The previous section reported on the evolution of the studied sample through Rounds 1 and 2. This section describes the three groups of sessions and the logic of their selection in more detail.

All of the studied sessions shared some common characteristics, such as a period of planning before the session itself took place and the limited time available for the actual session, though the amount of planning time and session time varied. The Mobile Agents sessions had hours or days in planning time, while the Ames and Rutgers sessions had a single hour; the sessions themselves lasted one to just over two hours for the Mobile Agents sessions vs. 15-20 minutes for the Ames and Rutgers sessions. The sessions varied in their settings (virtual meeting for RST, face-to-face in the case of the other seven), their context (portions of longer 'in situ' projects for the Mobile Agents projects vs. one-time workshop settings for the Ames and Rutgers sessions), and the level of interpersonal familiarity of participants and practitioners (intact project team members for the Mobile Agents sessions, members of the same academic department for the Rutgers sessions, and largely first-time acquaintances in the Ames sessions).

The sessions cluster in three groups corresponding to their context, as shown in Table 4.1.

**Table 4.1: Session groups**

| Session Group | Skill level of practitioners | Number of studied practitioners / sessions | Setting | Relationship of participants/practitioners to each other and to Compendium use |
|---|---|---|---|---|
| **Mobile Agents** | Expert | Two/Two | Two of many meetings in a larger project | Project team members, accustomed to working with Compendium as one of the project's tools |
| **Ames** | Mostly novice | Nine/Four | Half-day workshop | Largely first-time acquaintances with a common interest in the Compendium software |
| **Rutgers** | Mostly novice | Three/Two | Half-day workshop | Members of the same academic department, some of whom had little to no previous involvement with Compendium |

Sections 4.3.1 through 4.3.3 describe each group of sessions in more detail.

### 4.3.1 The Mobile Agents sessions (Hab and RST)

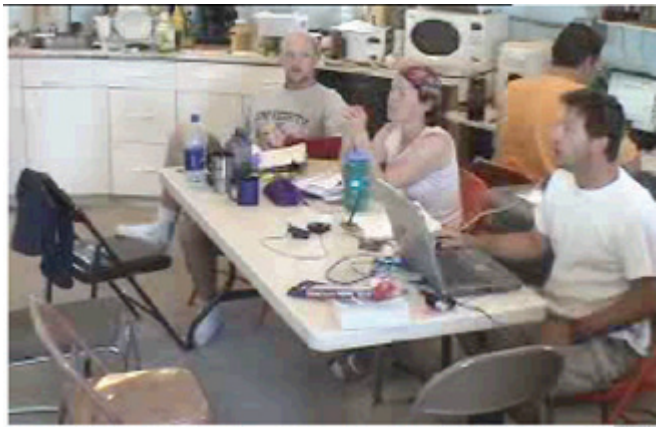


**Figure 4.2: Hab session's mapper/facilitator and participants during their session**

The two Mobile Agents sessions comprised the cases and analysis for Round 1. They occurred in the context of the 2004 Mars Society/NASA Mobile Agents field trial (Clancey et al., 2005; Sierhuis & Buckingham Shum, 2008). The aim of the field trial was to research how best to support Remote Science Teams (RSTs), who in actual space missions are likely to be spread across the Earth in multiple time zones. This mission provided a test bed for new kinds of collaboration technology to see how well these tools and methods can connect RSTs with each other, and with a crew located on another planet. The "Hab" crew in the Utah desert was a proxy for a team stationed on Mars in a future mission. A key research focus was to understand how the teams could work with maximum efficiency, productivity, and coherence in the extremely compressed timeframes they had to do their science analysis and planning work.

The two sessions analyzed in this thesis were among a number of such sessions in the 2004 Mobile Agents project concerned with planning extra-vehicular activities (EVAs). After each EVA, the Hab crew would prepare its materials (along with dozens or hundreds of images and other data files uploaded to a web-based semantic database system called Science Organizer). After a delay of several hours, the RST then had to examine and digest this material in order to formulate an analysis and recommendations for the next EVA, all in the space of a two-hour teleconference.

The job of the Compendium practitioners was to downlink the science data and analyses, prepare materials in a form that the teams could examine most rapidly, convene the teleconference and web conferences (or face-to-face meetings in the case of the Hab crew), facilitate the discussion while it unfolded to keep it focused and on track, capture questions, ideas, and recommendations on the fly in Compendium, format the materials in the best possible form, then uplink the materials for the other team and publish them on the web. RST members and facilitators operated in a 'loosely coupled' mode, working as a virtual US-UK science team, from separate offices and homes, having never met in person, picking up tools and data from diverse emails and web links as well as specialized software. The facilitators had to work adeptly with the software tools in question while

simultaneously playing conventional meeting facilitation roles and participating actively in the discussions.

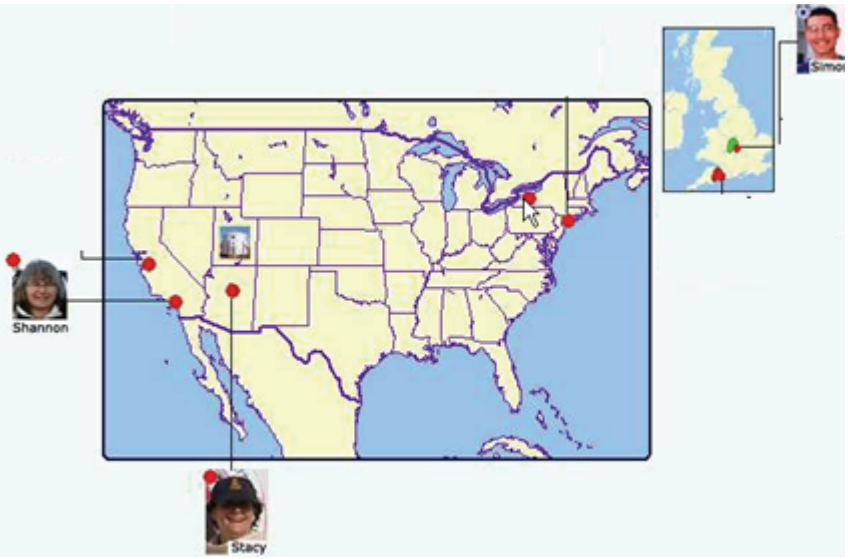



**Figure 4.3: Mapper/facilitator and two of the three participants for the RST session**

The researcher was not involved in either of the studied Mobile Agents sessions. The video recordings were provided to the researcher as part of the larger data collection effort for the Mobile Agents project as a whole. In section 6.1, a detailed description is provided of a critical incident in the Hab group session, as an illustration of the video analysis methodology deployed.

### 4.3.2 The Ames sessions (AG1, AG2, AG3, and AG4)

AG1's mapper during the large group session

AG2's facilitator introducing the map to the participants at the start of the session

AG3's small group planning session

AG4's mapper during the large group session

**Figure 4.4: Ames sessions**

The Round 2 Ames sessions took place in a workshop setting, at a gathering of people interested in the Compendium software and approach, held at NASA Ames Research Center in California on May 2, 2007. Four small groups (two to four people each) were given a task to plan and prepare a large group exercise that involved participants in making some sort of changes to Compendium maps. Each group received a seed set of images and examples, but the small groups were free to diverge in any direction as long as their exercise involved engaging the large group in making changes to the map. Indeed the main point of the setup was to give the groups experience in coming up with mapping strategy then carry it out "in the line of fire" in a real-time, public mapping event.

The session was billed as an opportunity to practice Compendium skills and get feedback from experts. The attendees, informed that the sessions would be recorded on video and screen recordings for research purposes, signed authorizations giving their approval for this (signed forms on file). The attendees were given advance access to the exercise materials[7] if they wanted to review them before the workshop. Each of the four small groups was given about ninety minutes to prepare their exercise. Each group included one expert practitioner[8], who was allowed to help design and prepare the exercise, but not to be one of the facilitators or mappers during the large group exercise itself. Although the involvement of an expert might be thought to give an advantage in coming up with focused and effective session plans, in fact there was a wide disparity in the success of the plans in actual practice, as will be seen in Chapter 6.

The researcher did not take part in the small or large group sessions except to answer general questions such as time remaining and technical matters; he did not answer questions about how to proceed with the exercises themselves.

After the preparation period, each small group took turns introducing and conducting their session with the larger group of participants. Typically each group had one person acting as mapper (hands on the keyboard and mouse controlling the Compendium display) and one as facilitator (guiding the discussion from in front of the room). Each group had fifteen minutes for their session, followed by a debrief discussion in which they also received feedback from the four expert practitioners in attendance.

After the sessions, all attendees were asked to complete a questionnaire with questions both about their background with Compendium and related tools, as well as about the sessions themselves (see section 4.4).

[7] http://compendium.open.ac.uk/institute/download/ames.zip

[8] Two of these were the studied practitioners from the Mobile Agents sessions in Round 1.

All of the small and large group sessions were recorded. The small group sessions were recorded using Camtasia screen and audio capture. The large group sessions were recorded with both miniDV video and Camtasia.

### 4.3.3 The Rutgers sessions (RG1 and RG2)

RG1's mapper/facilitator and participants during their large group session

RG2's mapper and facilitator working together during the large group session

**Figure 4.5: Rutgers sessions**

The second non-expert setting was at the School of Communication, Information, and Library Studies at Rutgers University on June 13, 2007. The materials, format, activities, and follow-up were very similar to those at the Ames sessions, except that there were two session groups and nine attendees all together.

The sessions took place in a half-day workshop, set up as a research experiment. Small groups were given a task to plan and prepare a large group exercise that involved participants in making some sort of changes to Compendium maps. The same set of images and examples were given as at Ames, and again the small groups were free to diverge in any direction as long as their exercise involved engaging the large group in making changes to the map.

Participants had diverse backgrounds but were all either faculty members or graduate students in the department, sharing some level of research interest in communication tools and practices. All of the attendees took part in the small and large group exercises. Participants were aware that the

sessions were being recorded for later research purposes. As in the Ames sessions, the researcher did not take part in the small or large group sessions except to answer general questions.

All of the small and large group sessions were recorded. The small group sessions were recorded using Camtasia. The large group sessions were recorded with both miniDV video and Camtasia. Unfortunately, the Camtasia screen recordings of the large group sessions at Rutgers were damaged and unavailable for analysis.

#### 4.3.3.1 Summary

This section described each of the three locales comprising the sample of sessions studied in this thesis. Although the sample size is small – eight sessions with fourteen practitioners – the three locales provided sufficient diversity of settings, skill levels, type of approach, relationships among participants and practitioners, and even meeting type (virtual vs. face to face). The next section discusses how this diversity was measured and provides further details on the sample characteristics.

## 4.4 Sampling and practitioner diversity

Choosing cases for comparative analysis in qualitative studies requires somewhat different criteria than in a quantitative study. Since the intent is in-depth exploration of a relatively under-researched phenomenon, cases must be selected "without any claim to knowledge of the whole field" (Christians & Carey, 1981: 354). The attempt in this thesis was to select enough cases to provide a diversity of situations and practitioner types, without any claim to random or exhaustive variety such as would be appropriate for a quantitative study (Stenius et al., 2004: 92-93). The small size of the sample allowed for close, extensive analysis of practitioner moves and their meanings in context. It echoes Kolbe & Boos's (2009) study of facilitator subjectivity in group coordination, who relied on interviews with eight experienced facilitators, which were sufficiently "heterogeneous" in occupation, sex, and experience to provide a "multi-faceted description of the experts' subjective

theories on explicit group process coordination." They state that the "manifoldness of the responses counters some of the limitations of the small sample size."

This section presents the means by which practitioner diversity was assessed as well as initial descriptions of the character of that diversity. Further indications of practitioner diversity are presented in Chapter 8.

### 4.4.1 Questionnaire

The questionnaire was designed to create a profile of the studied practitioners, with the intent of gauging both similarities and differences among the sample. Of special interest were the degree of skill and experience in creating facilitative visual representations.

The questionnaire comprised 25 questions and space for comments. The first thirteen questions assessed skill and experience levels with facilitation (both software-assisted and not), concept or knowledge mapping software, Compendium, and hypermedia. Questions 15 through 22 addressed the roles that the respondents played in the small and large group sessions, and their opinions about each. Finally, respondents provided their sex, nationality, and profession. [9]

[9] Although a total of 21 respondents completed the questionnaires (attendees at the Ames and Rutgers sessions), the analysis in this thesis only includes data from the fourteen respondents who actually performed as practitioners in the eight studied sessions. Data from the remaining seven questionnaires comprised respondents who did not actively perform as practitioners (though they were members of the planning teams for the sessions) and were not included in the analysis. Both Mobile Agents practitioners attended the Ames session and completed questionnaires, though they did not perform as practitioners in any of the Ames sessions. Their responses are included with reference to the sessions (Hab and RST) in which they acted as practitioners.

The questionnaire instrument itself is shown in Appendix 11.1. Appendix 11.2 provides the distribution of responses to each question on the survey. Chapter 5 reports on key findings from aggregated data in the questionnaire responses as they relate to the chief concerns of this thesis. The following section provides a picture of the diversity of respondents that emerged from the data.

### 4.4.2 Diversity of studied practitioners

Chapters 5 through 8 provide analysis of practitioner skill and experience diversity, especially as it relates to the dimensions and categories emerging from the qualitative analysis. This section provides basic details about the diversity of the respondent sample.

Note: Participant as opposed to practitioner diversity was higher, but is not reported in this study.

#### 4.4.2.1 Demographic diversity

Table 4.2 through Table 4.5 give a picture of demographic diversity among the studied practitioners. Half of the practitioners were men and half women. Most were from the USA, where all of the sessions were held with the exception of the RST virtual meeting, in which both practitioner's was located in the U.K. Four were from Europe. Respondent professions were primarily either "consultant" or researcher/academic (five respondents each) with four respondents listing miscellaneous other professions. All of the respondents' self-reported professions are listed in Table 4.5. It is notable that none of the respondents gave their profession as "facilitator" despite some high levels of facilitation experience as reported in section 5.3.1, indicating that facilitation is part of some of the respondents' professional toolkit but not their primary identity.

**Table 4.2: Sex of studied practitioners**

| Sex | Quantity |
|---|---|
| Female | 7 |
| Male | 7 |

**Table 4.3: Nationality of studied practitioners**

| Nationality | Quantity |
|---|---|
| USA | 10 |
| UK | 2 |
| Italy | 1 |
| Netherlands | 1 |

**Table 4.4: Profession categories of studied practitioners**

| Profession | Quantity |
|---|---|
| Consultant | 5 |
| Researcher/academic | 5 |
| Other | 4 |

**Table 4.5: Self-reported professions**

| Self-reported professions |
|---|
| Business manager & life coach |
| Consultant |
| Consultant |
| Consultant, PhD student |
| PhD student |
| Professor |
| Programmer |
| Regulator (water utilities) |
| Research scientist - software |
| Researcher |
| Technical training manager |
| Thinker, zooming user interface researcher |
| University researcher |
| Unrelated |

#### 4.4.2.2 Distribution of software- and Compendium-based facilitation experience in the sample

This section shows two key practitioner diversity indicators from the skill and experience portion of the questionnaire. Both questions used a five point scale, with Never=1, 1-5=2, 6-20=3, 21-50=4, and greater than 50=5.

Figure 4.6 shows the distribution of responses to the question "How many times or sessions have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Explorer, GroupSystems, etc.) in a shared display?*" The question was designed to measure the depth of software-based (as opposed to general) facilitation experience, assuming that the greater number of actual software-based facilitative encounters, the deeper the amount of experience. As with non-software-based facilitation, the frequency measure for software-based facilitation experience was more widely distributed than the length of such experience. Four of the respondents indicated they had never acted as a software-based facilitator, while three responded

that they had done so between one and five times. An additional three indicated they had acted as a software-based facilitator between five and twenty times, while the remaining four had a greater degree of frequency of experience of more than twenty-one software-based facilitative sessions. Low frequency (twenty or fewer instances) of such experience was characteristic of at least one and often both of the "non-expert" practitioner sessions (Ames and Rutgers), without exception. Of the expert practitioners, the RST had a lower number of instances (between 21 and 50) while the Hab crew practitioner had 51 or more.

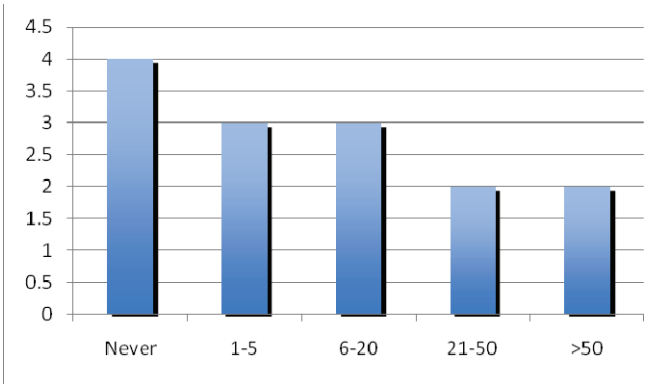



**Figure 4.6: Distribution of responses for frequency of facilitation with any kind of software**

The average for the fourteen answers was 2.64, much lower than the average rating for general facilitative encounters (3.50), indicating average numbers of facilitation instances between six and twenty. Excluding the two experts' responses, the average was 12% lower, at 2.33, with an expert/non-expert difference of 48%.

Figure 4.7 shows the distribution of responses to the question "How many times or sessions have you acted as a facilitator of groups *using Compendium in a shared display*?" The question was designed to measure the depth of specifically Compendium-based facilitation experience, assuming that the greater number of actual encounters using this specific software, the deeper the amount of relevant experience. The frequency measure for Compendium-based facilitation experience was more widely distributed than the length of such experience. Ten of the respondents indicated five or fewer such encounters, while only two of the non-expert respondents indicated as many as six to

twenty such encounters. Of the expert practitioners, the RST's practitioner had a lower number of instances (between 21 and 50) while the Hab crew practitioner had 51 or more.

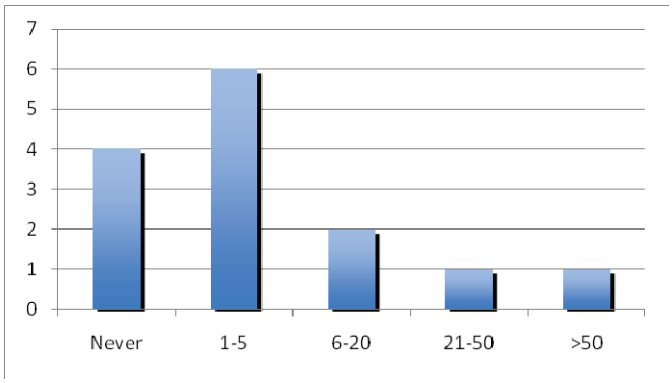



**Figure 4.7: Distribution of responses for frequency of using Compendium facilitatively**

The average for the fourteen answers was 2.21, indicating average numbers of facilitation instances between six and twenty. Excluding the two experts' responses, the average was 17% lower at 1.83, one of the wider differences of any of the basic categories, indicating that depth of experience facilitating with Compendium was one of the main differentiators between experts and non-experts in this sample. The expert/non-expert difference was 59%, the second largest gap of all the skill/experience measures.

#### 4.4.2.3 Summary

This section described the approach used to ensure sufficient diversity in the studied sessions as the basis for qualitative findings. It described the questionnaire used to gather supporting data from participating practitioners, and reported on indicators showing that the fourteen practitioners had a high degree of relevant skill and experience diversity in areas key to their performance when facilitating sessions with the Compendium software. As will be shown in Chapters 5 through 8 , these differences explain much, though not all, of the variation shown in the actual sessions. The following section describes the generic task given to the non-expert practitioners from the Ames and Rutgers sessions.

## 4.5 The practice task for the non-expert sessions

As discussed in section 4.2.2, the Ames and Rutgers sessions were designed to contrast with the Mobile Agents sessions by providing a generic facilitation task rather than the project-specific tasks that the Hab and RST practitioners undertook. This section describes the task given to the Ames and Rutgers practitioners.

The practice task was designed to require little prior knowledge of the Compendium software, although some familiarity with basic operations was helpful. Not requiring subject matter or other contextual background allowed the preparation and practice sessions to occur within a couple of hours without any advance preparation on the part of the attendee practitioners.

Since the first setting for the task was to be a Compendium workshop held at NASA Ames, the selected task was on the theme of space travel. To that end, 127 images of space travel of various kinds were gathered, mostly from Google Image Search. A set of sample exercises that the practitioners could follow (if they chose) was prepared, along with Compendium project files that contained all of the images as Compendium hypermedia nodes, and also contained the sample exercises and instructions (see Figure 4.8). The task involved preparing an exercise that the practitioners would lead a larger group through. It could be any of the sample exercises or anything else of the practititioners' choosing, with the only firm requirement that it had to involve facilitating the large group in making some kind of changes to the projected Compendium representation.

As will be discussed in Chapters 5 through 8, practitioners in the six Ames and Rutgers sessions all took different approaches to their exercises and had differing mixes of participant relations, sensemaking challenges, and outcomes. The tools for studying the sessions themselves are described in the following section.

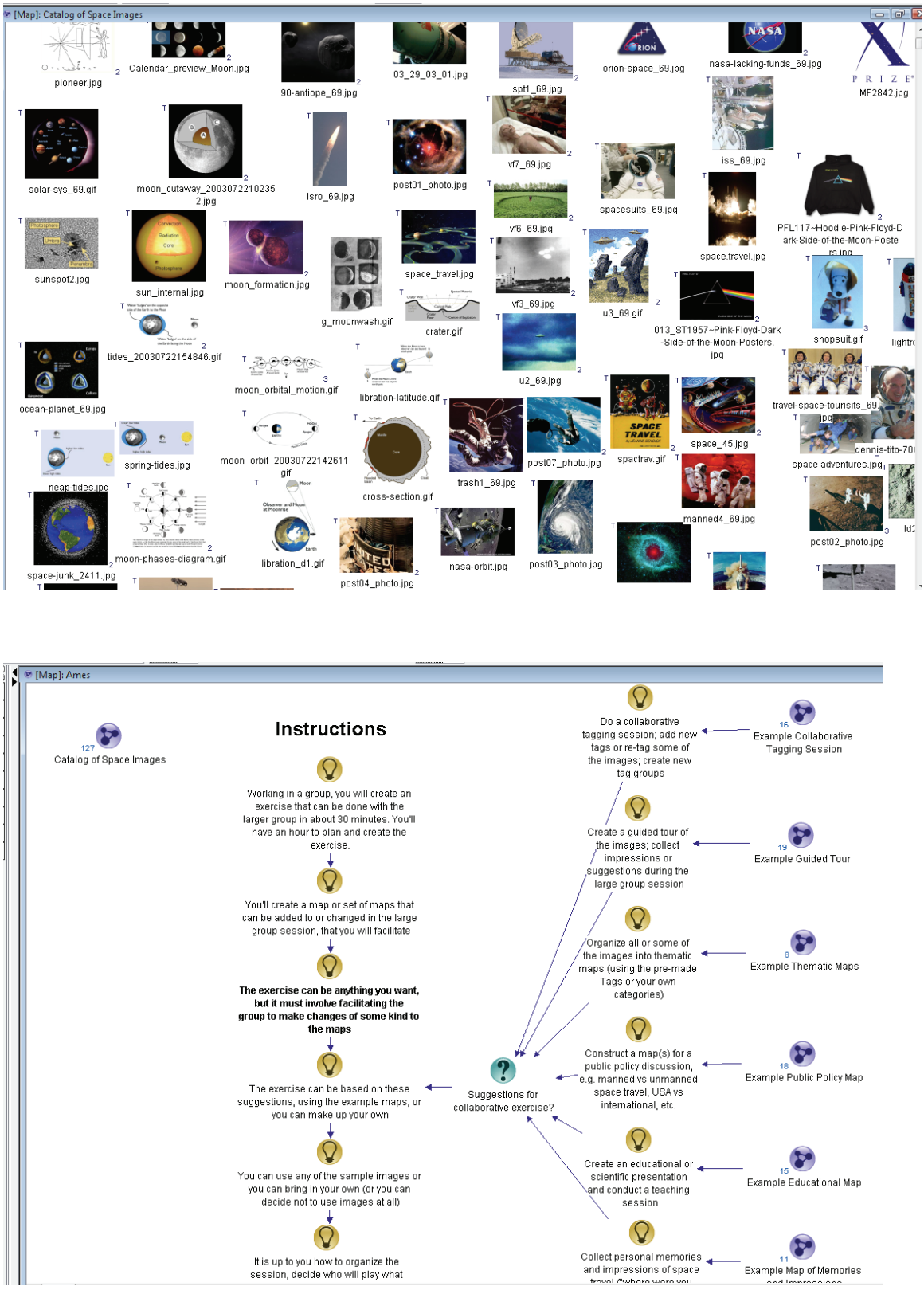



**Figure 4.8: Space travel images and portion of practice task instructions for the Ames and Rutgers sessions**

## 4.6 Tools for analyzing individual sessions and practitioners

As it often delves into areas where previous research has not covered directly, qualitative research frequently requires the development of new methods (Chenail, 1995). This section provides further description of the tools developed in Rounds 1 through 3 (see section 4.2). The five tools described below emerged from repeated rounds of analysis and reflection. In each, analysis started from the video data, identifying patterns and concepts that appeared to recur in the moves and statements contained in the video recordings. As the rounds proceeded, the need for tools that would target the dimensions of interest at the desired levels of granularity became clearer, and the nature of the tools required better understood.

The full set of analysis tools is summarized in Table 4.6 and described further in sections 4.6.1 through 4.6.5. The completed analysis artifacts for all of the studied sessions are available online at http://people.kmi.open.ac.uk/selvin/analysis/.

**Table 4.6: Summary of analysis tools used**

| Analytical Tool | Description |
|---|---|
| Shaping form | Characterizing the representational character of the whole session to delineate the intended and actual shaping that took place |
| CEU analysis | Mapping the coherence, engagement, and usefulness (CEU) dimensions of timeslots within the session. Aids in identifying sensemaking episodes |
| Narrative description | Rich description of a sensemaking episode, including dialogue and descriptions of events |
| Grid analysis | Micro-moment moves and choices during the episode |

| Analytical Tool | Description |
|---|---|
| Framing analysis | Characterizing the practitioner actions during the episode in aesthetic, ethical, and experiential terms |

Generally, the analytical instruments described in the following sections were applied in the sequence represented in Figure 4.9 for each of the studied sessions[10]. The aim in following this set sequence was to achieve both qualitative triangulation (Fortner & Christians, 1981) and increasing theoretical sensitivity (Strauss & Corbin, 1990) by looking at the data through multiple lenses.

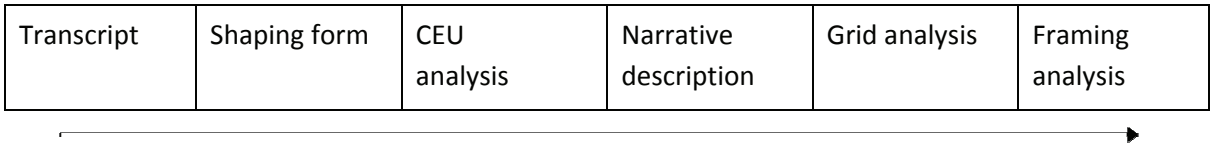



**Figure 4.9: Analysis sequence**

### 4.6.1 Shaping form

The Shaping form comprises a set of questions asked about the session as a whole. It aimed at characterizing the representational character of the session. It describes what kinds of roles participants and practitioners played in the shaping of the representation, both as a result of planning and intention, and in response to whatever exigencies actually occurred during the session.

The questions included a characterization of the overall ecosystem of the session (the surrounding context, purpose of the session, types of participants), as well as a number of questions designed to put focus on the interaction of people with the representation. Table 4.7 relates the questions to the dimensions of the framework in section 2.1.

[10] The CEU analysis and Shaping form were developed after Round 1, and the Framing analysis after Round 2. They were applied to the two Round 1 sessions (Hab and RST) in Round 3.

**Table 4.7: Relation of Shaping form questions to conceptual framework**

| Shaping form question | Relation to framework |
|---|---|
| What shaping was intended (how the session was planned to work, what shaping the planners intended to occur, and how it would be accomplished)? | Shaping itself is largely the province of aesthetics [p], the construction of meaningful form. This question refers to the planned or intended sorts of shaping (which may or may not have occurred in the actual session). |
| What was the level and quality of participant and practitioner engagement (with maps, subject matter, process, environment)? | This question concerns the relationships of participants, practitioners, and representation to each other [framework elements d, e, f, g], as well as to the surrounding context and resources [i, j]. |
| What types of shaping actually occurred during the session? | Means to report what sorts of aesthetic shaping [p] took place in the actual session. |
| If the intended shaping went awry, why did that occur? What blocks an intended shaping? How are the blocks resolved or avoided? | Identifies what sensemaking [s] triggers may have occurred, placing them in the context of the overall narrative trajectory of the session [r]. Explores the degree of improvisation [t] in resolving or avoiding obstacles to progress. |
| Who did the shaping, for what reasons? What contributions to the shaping occurred? | Maps the shaping actions [p] onto the way their performers related to the representation [d, f]. |
| How were decisions about shaping made? What kinds of decisions were they? Who made them, on what basis?<br>How were these decisions taken up into the representation itself (if they are)? Which are ignored or dropped? Why? | Looks at the choice making involved in both shaping actions and participant inclusion or exclusion in those actions. Often the clearest way to discern the situational ethics [q] of the practitioners. |

The result takes the form of a narrative document (e.g. Figure 4.10).

If the intended shaping ran off the rails, why did that occur?

> There was no significant running off the rails in this session. Even when the mapper got slightly behind, the facilitator made sure that she provided (or asked again for) material that hadn't been captured. The map was slightly messy by the end, but coherent (well-formed questions, links, and answers).

Who did the shaping, for what reasons? What contributions to the shaping occurred?

> The facilitator and mapper managed the map shaping itself for the most part. Participants contributed ideas verbally throughout but did not question or suggest shaping moves (they appeared to readily accept how the shaping was done). Most participant refinements were verbal rather than map-oriented.

How were decisions about shaping made? What kinds of decisions were they? Who made them, on what basis?

How were these decisions taken up into the representation itself (if they are)?

> See previous. As mentioned above it appeared almost as if the mapper and facilitator had rehearsed and agreed how they would work together. They presented what would look to a newcomer as a nearly seamless front, with the facilitator appearing to prompt the mapper's actions (that she had in fact already started in most cases (e.g. "We're just adjusting the map so we can get a little more space here")), sometimes suggesting that something should be captured differently (e.g. as a question with hanging answers).

**Figure 4.10: Portion of the Shaping form from the AG4 session**

With the overall character of the representational role described in the Shaping form, the CEU tool was next used to zoom into a lower level of detail to characterize the session as it unfolded over time.

### 4.6.2 Coherence, engagement, and usefulness (CEU) analysis

Coherence, engagement, and usefulness (CEU) are normative imperatives that a participatory representational practitioner should follow in any session:

- Keeping the hypermedia display, and the interaction of participants with it as well as with each other, *coherent* – understandable, clear, evocative, and organized. At any moment, the meaning and organization of the visual and textual elements of the

hypermedia display should be clear to participants (as well as practitioners) with “appropriateness of language, form, and structure to their purpose" as well as "completeness" and "persuasiveness" (Small, 2009: 266)

- In any facilitated session involving any sort of visual representation, whether a whiteboard, easel sheet, or complex hypermedia software projected in front of a room, the value of the display is directly related to the degree to which the participants are *engaged* in it – they are looking at it, talking about it, referring to it, involved in its construction or reshaping

- The representation should, as much as possible, be adding value for the participants and helping to fulfill the goals of the session, the participants, and the larger effort of which the session is a part. It is the responsibility of the practitioner to make sure that the representation is a *useful* part of the proceedings. *Usefulness* refers to the extent to which the representation appears to be adding value for the participants and helping to fulfill the predetermined or emergent goals of the session

In this analysis, the CEU dimensions of each timeslot are given ratings to build up a signature (in the sense of a distinctive pattern that indicates the character) for the session. When visualized as a grid, this provides a gestalt view, showing the extent to which the representational artifact being maintained by the practitioner was constructed together with participants, in a way that seemed to add value.

Each of the three CEU criteria could be further broken down into types or dimensions. For example, one could speak of any of the criteria in terms of visual, textual, hypertextual, interpersonal, etc. A criterion like "engagement" can be viewed on many levels: engagement with the map as viewers, engagement with the map as makers, engagement with facilitation, engagement with each other,

and so on. In this thesis, the types are at a general "session" level. The ratings are not value judgments on the quality of the session, but rather the degree to which the three dimensions are being fulfilled in that timeslot, especially with regard to the hypermedia representation.

The tool was applied as follows. Each session's video and screen recordings were divided into timeslots. Each timeslot was assessed in terms of the CEU of the relationship of the participants to the hypermedia display. There are three ratings: High (three points), indicating a high or strong degree of engagement, coherence, and usefulness; Medium (two points), indicating a medium or average degree of the three criteria; and Low (one point), indicating that there was a low degree during that timeslot. Table 4.8 provides a set of examples illustrating how each rating is derived from the video data. Each individual rating was derived from the specifics of the session and timeslot itself, and thus they vary in the salient aspects that could be discerned from the video data. Some ratings were assigned based on participant comments or observations of practitioner actions, while others by examining the representational artifact itself at that moment in time in the context of the current participant statements or actions.

**Table 4.8: CEU ratings and exemplars**

| Criteria | Low | Medium | High |
|---|---|---|---|
| Coherence | The representation is unclear or bears little fidelity to the current focus of interest; e.g., a participant remarks that "I do not see what we're talking about" on the map | Moderate level of coherence, e.g., some confusion about the meaning of the way various nodes on the map are tagged, but generally the representation is clear enough to follow | The representation is a clear reflection of the discussion or exercise, in form, content and organization. All participant contributions have clear places to be entered and linked on the map |

| Criteria | Low | Medium | High |
|---|---|---|---|
| Engagement | The participants are paying little or no attention to the map; e.g., some participants are having a side conversation with no reference to the map | An example is when participants start to make side conversation while practitioners are in the midst of making a complicated change to the map, rendering it temporarily less than clear | Participants are looking at, talking about, and appearing to care about what is on a map; e.g., a participant validates that the way the practitioner has captured his/her input on the map is accurate |
| Usefulness | The representation is not acting as a tool toward the realization of the session's purpose; e.g., the map is no longer keeping up with either the intended exercise or the emergent conversation | This is evident when it is partially, but not completely, clear to the participants how the map will help them complete the exercise | High usefulness indicates that the representation is integral to the achievement of the session's purpose; e.g., the structure put in place for the exercise is working efficiently; participants understand the sequence of events and actions |

For example, the representation in a specific timeslot might display a high degree of clarity and "readability"; all the content is legibly presented and laid out, and is faithful to the statements, tone, and purpose of the meeting (at least of its current activity). Thus both Coherence and Usefulness would be rated as High (3 points each). However, at that moment the participants are caught up in a side topic and are not paying attention to the representation, therefore Engagement would be rated as Low (1 point).

By assigning a color to each rating in the spreadsheet, *heat maps* are generated that provide a gestalt visualization of the whole session in terms of the three criteria. Figure 4.11 shows the comparison of CEU heat maps from the eight studied sessions. Such heat maps make it possible to identify the overall tenor of the session, and to point out where sensemaking moments, or breakdowns, may have occurred—typically when the 3s (High ratings, green shading) drop to 2s (yellow) or 1s (red), indicating that the representational artifact seemed to add little or no value at that moment. When

a session has High ratings throughout, it can indicate that the preparation and execution of the session (design and realization) were both well thought out in advance and handled in practice. In such sessions, possible breakdowns are avoided, often through the expertise of a practitioner.

Figure 4.11 also shows an overview of the sensemaking character of the studied sessions. This visualization shows that three of the Ames sessions contain a fair amount of red cells, indicating Low ratings for one or more of the CEU elements (possibly reflecting the relatively novice level of most of these sessions' practitioners). These are moments in the session when the session went somewhat awry in terms of the practitioners' intentions for having the group co-construct the representation. These would be prime locations to look for the sensemaking triggers (what set off the drop in the ratings), as well as what the practitioners or participants did to restore the session to better functioning. The remaining Ames session as well as the two Rutgers sessions had few or no drops, indicating that the practitioners and participants experienced relatively unproblematic going. Black rectangles indicate the segments selected as analysis as sensemaking episodes (critical incidents).

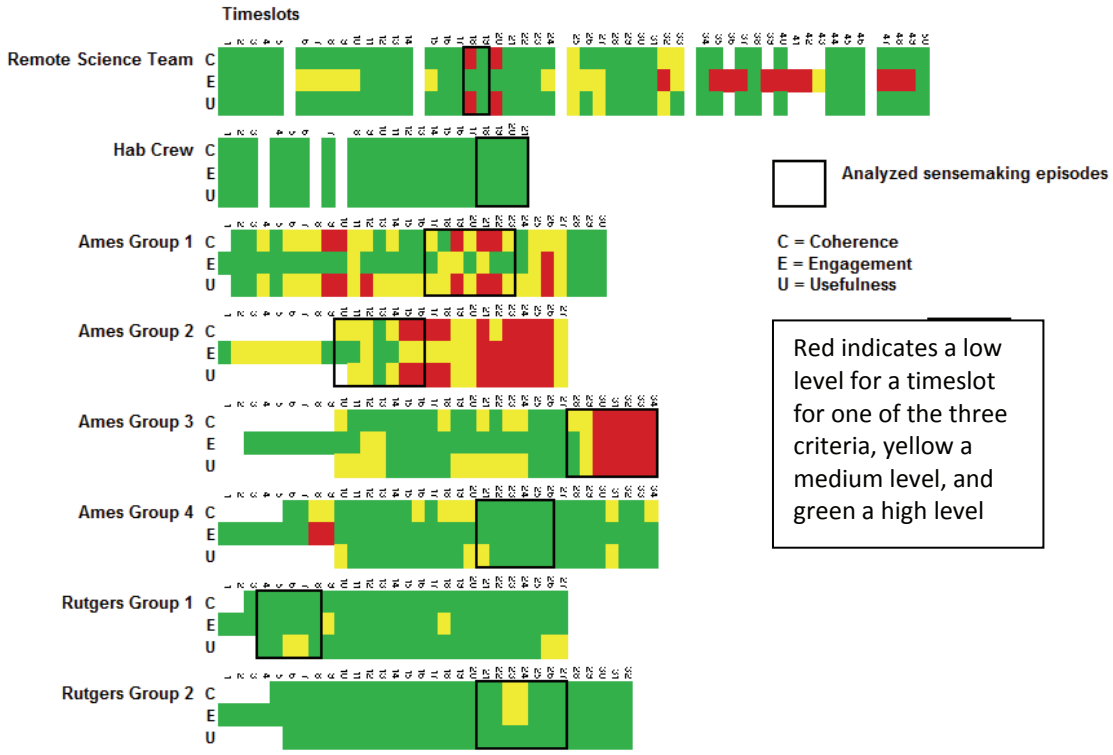



**Figure 4.11: Heat maps from CEU analyses**

Other researchers (e.g., Yoong & Gallupe, 2002) apply to electronic meetings similar coherence and engagement constructs as these. The main difference is one of granularity of analysis. The primary interest for this thesis is closer to the brushstroke level – understanding the meaning of the individual practitioner move, when set in context – than the whole-meeting level at which other researchers apply ideas of CEU. Small (2009) used a similar approach in his method for analyzing students' responses to poetry.

After reviewing the Shaping form and CEU analysis for a session, a particular sensemaking episode was selected for closer analysis. This new analysis started with a narrative description.

### 4.6.3 Narrative description of sensemaking episodes

The narrative description provides a rich delineation of a sensemaking episode within a session. For this, a starting and ending point for the episode was identified, from the point of the sensemaking trigger (an event or anomaly that initiates some sensemaking behavior) to its resolution or

culmination. Sometimes there was no resolution per se, for example, when the practitioners were not able to bring a session back on track after a breakdown. This can happen when participants cease engaging with the representation and just talk to each other without any reference to the representation. Examples of these descriptions are provided in sections 6.1 and 7.1.

Writing out a narrative description in this manner focused the analysis on the place each move or choice had in the way the sensemaking episode unfolded. The Grid analysis drilled down into even a finer level of detail.

### 4.6.4 Grid analysis

The Grid analysis looked at each practitioner/participant statement or representational move for each sensemaking episode according to a number of criteria. The criteria themselves developed over a number of iterations, especially for the initial application for the Mobile Agents sessions. This provided a fine-grained understanding of various dimensions of each move, such as the degree and kind of participant engagement with the representation at that moment; the engagement of the practitioner with the participants (e.g., acting in direct response to direction from a participant, or working off to the side to clean up some aspect of the map, or preparing for an upcoming event); the aspects of the setting on which practitioners were focused for that move (participants, maps, text, subject matter, surroundings, or process), and other factors. Mapping each move on the grid required careful consideration about what that move meant in the context of both the session as a whole and within the particular sensemaking episode, sensitizing the analysis in terms of the meaning to both participants and practitioners. Table 4.9 shows a portion of the taxonomy of concepts used in the Grid analysis, derived from open and axial coding through repeated analyses of the Mobile Agents sessions in Round 1.

The example Grid analysis section shown in

Figure **4.12** illustrates six practitioner moves: two verbal statements (at 14m47s and 14m51s) and four actions on the representation, at 14m46s, 14m48s, 14m51s (at the same time as a verbal

statement) and 14m59s. Four of these moves were done with simultaneous focus on participants (engaged in conversation with them), maps (working on the form of the map), text (working with the text of the map's icons), and the subject matter of the session, while one (the Link move at 14:59) is a shaping move on the map itself.

**Table 4.9: Move-by-move analysis schema for Grid analysis**

| Aspect | Description |
|---|---|
| Move Type | Assigns each practitioner move to a type in a taxonomy of moves in the *Compendium* software tool (e.g., Node Move-Arranging, Navigate-Map Open, etc.), or Verbal move types (Statement/Announcement, Acknowledgement, Query, Helpful Comment, Exclamation) |
| Participant Engagement with Representation | Characterizes the degree to which participants are paying attention to the representation during the move. Possible values: Active, Direct, Delinked, Partial, and Unclear. The Active value, which refers to moments when participants are directing the practitioner to perform particular actions on the representation, has the subtypes Text, Validation, Navigation, and Structure |
| Practitioner Response/ Engagement Mode | Characterizes the degree to which the practitioner is engaged with the participants during the move. Possible values: Direct, Semi-Direct, Indirect, Delinked. Delinked refers to moves when practitioner attention is focused completely on manipulation of the representation, not interacting or responding to the participants |
| Practitioner Focus | Characterizes what the participant is paying attention to or working with during the move. Can be (and often is) multiple. Values: Participants, Maps, Text, Subject Matter, Surroundings, Process |

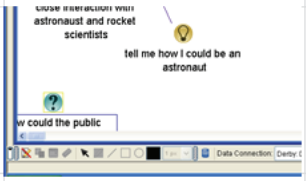
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15:32:00 | 15:43:00 | | [C15:32] D: So if we put a question that said how could the public become co-creators? Of the program? [V28:33] And then let's capture a couple of your, your ideas about that. | Direct | | which prompts L to abandon the node | Verbal Query |
| 15:36:00 | 15:37:00 | | | Indirect | | Deletes the new node | Abandon |
| 15:39:00 | 15:50:00 | | | Semi-Direct |   | Creates a new Question node where the previous (deleted) node was, giving it the label "How could the public become co-creators of the project?" | Node Create-Question |
| 15:50:00 | 15:53:00 | | | Semi-Direct | | label displayed below the bottom of the visible map, L. moves over to the right lower scollbar arrow to scroll the map up, | Display Move-Making Display Amenable |
| 15:51:00 | 15:51:00 | | D: Um... I think .. [C15:51] | Direct | | D. then prompts L. to create specific Idea nodes in response, and also directs/simultaneously narrates at C15:51 as L. scrolls the map up so the question can be seen more easily on the map. D. simultaneously buys her time, explains what L.'s doing, and prompts her to create the next nodes: | Verbal Narration |
| 15:51:00 | 15:57:00 | | D: let's move that up a little so we can all see it and then I think he said what was it? One was a contest for... | Direct | | | |

**Figure 4.12: Portion of the Grid analysis from the AG4 session**

The Grid analysis required very close inspection and increased sensitivity to nuances of the data. However, the process clearly demonstrated how much is going on when a skilled practitioner is at work, supporting a team with the digital artifacts and rationale it needs as their deliberations unfold. Moreover, the Grid analysis set the stage for characterizing practitioner actions and choices according to a set of criteria derived from the dimensions discussed earlier. This is called the Framing analysis.

### 4.6.5 Framing analysis

The Framing analysis characterizes practitioner actions during the session in aesthetic, ethical, and experiential terms. Reflecting the conceptual framework described in Chapter 2, the Framing analysis looks at how the practice and context interweave, and in what ways the aesthetic and ethical dimensions of the practice intertwine (McCarthy & Wright, 2004). It is a normative or ideal model against which to hold up situations of practice (Aakhus, 2007; Aakhus & Jackson, 2005). Kolbe & Boos advocate using a normative model to study facilitator subjectivity (2009). Such a model can

be used as a diagnostic tool to analyze what factors are preventing a situation from achieving its potential, or at least to characterize a practice situation in potentially useful ways.

The model used in the Framing analysis provides a set of components, elements, and exploratory questions to help determine how a context of service, the unique set of people, and the goals, constraints, situation, and subject matter can inform the shaping the practitioner performs on the representational object(s), and vice versa.

The model contains three columns. The first (leftmost) column shows the major categories or components of the practitioner's stance—his/her orientation toward various aspects of the situation or practice setting: the practitioner's towards him/herself and his/her own actions, towards the participants, and towards the situation as a whole. The middle column breaks down each stance into elements, each of which is explicitly related to the body of theory it arose from (largely from Bruner, 1990; Dewey, 1934; Schön, 1983, 1987; and McCarthy & Wright, 2004). These elements constitute an ideal model of practitioner stance; that is, the model specifies the preferred conduct of a practitioner as maintaining a dialogic orientation, fostering a heightened degree of connection between participants, the setting, purpose, and representation, and so on. The elements in turn generate descriptive (characterizing) or normative (evaluating) questions that can help guide the analysis of a particular setting, found in the rightmost column (the full Framing model is depicted in section 2.2.5.2).

Considering the questions put forward in the Framing model involved examining and reflecting on the analytical artifacts produced thus far. Since the Framing analysis came last in the analysis sequence, by that time the analyst was very familiar with the specific occurrences in the video recording of the session, and particularly with the nuances of the behavior demonstrated by the practitioners during sensemaking episodes.

For example, the Ames Group 2 case had the following responses for component A.5 (mediated objects and other interventions should preserve openness and dialogicity):

*How do the actions of the practitioners inhibit openness and dialogicity?*

The prepared map appeared (and was said by participants afterward to be) too complex/involved for participants to engage with, although the mapping of the "needs" section did seem to invite dialogue (unfortunately shut off by the mapper). The mapper's verbal intervention served to inhibit the nascent discussion about how to map the "needs" section.

In this case the practitioners needed either to be flexible in how the session would proceed, and evolve the map accordingly (with its extensive pre-structuring that the participants were not paying attention to), or to intervene again to bring the session back to the course that they had intended. They could have brought the attention of the group to the portion of the map that contained the desired area of focus and created an effective way for the group to engage with it. As it happened, they stood by and waited to see if the conversation would come back to the intended course of its own accord (rarely an effective strategy).

### 4.6.6 Granularity of the different techniques

Figure 4.13 shows the relative granularity of the analysis techniques described in the previous sections. The Shaping and Framing analysis look at the whole-session level, seeking to describe overall shaping behavior and framing considerations characterizing practitioner actions during a session. The CEU analysis aims both to give a concise picture of the trajectory of a session as a whole, from start to finish, but also to characterize the coherence, engagement, and usefulness of timeslots within a session. The Narrative Description of Sensemaking Moment and Grid analysis techniques provide finer-grained looks at specific choices and moves in the context of one or more timeslots, focusing on sensemaking moments where anomalies or other triggers cause sensemaking behavior on the part of practitioners. In the course of the individual session analyses, insights from

each of the analysis techniques employed helped ensure completeness and accuracy of the others, often prompting revisions in earlier analysis documents as the new insights emerged.

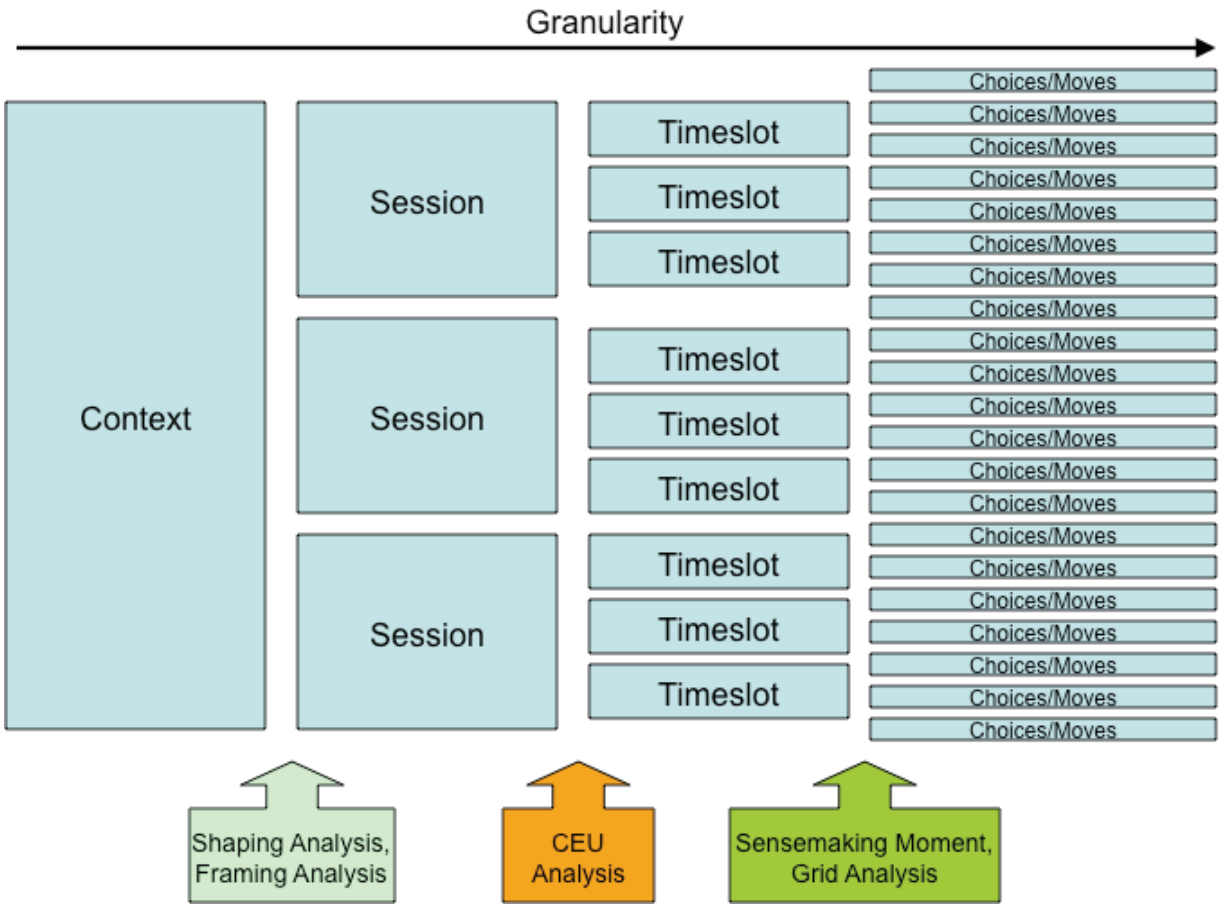



**Figure 4.13: Granularity of analysis techniques**

## 4.7 Comparative analysis approach

This section summarizes the approach used to synthesize and compare the results of the data-gathering and analyses described above.

The collected artifacts from the analyses described above comprised over 450 printed pages. All were reviewed, one analysis type at a time, noting patterns and dimensions that appeared to recur across sessions, starting with the eight Shaping analyses. Generally, they were examined for the following:

- Intended and 'lived-in' narratives, to give context to the breaches (sensemaking triggers) as well as 'canonicity' of the sessions

- Sensemaking triggers (discontinuities, dilemmas, and anomalies that the practitioners responded to)
- Shaping (the aesthetics/form of the representations, before and after sensemaking triggers)
- Collaboration & practitioner/participant interaction, especially choices the practitioners make that affect the 'interests' of the participants (i.e., ethics)
- Types of practitioner focus
- Types of improvised practitioner actions
- What is done in the sessions to make the representations 'work' (to make them coherent, engaging, and useful)

As the review proceeded, concepts were grouped into categories, and axial coding-type dimensions were noted (for example, what are the 'more' and 'less' types of values that would emerge when comparing aesthetic shaping and ethical choice-making). When each analysis type was concluded, the dimensions were then sorted into the groups and categories that will be presented in Chapters 6 and 7. Following this, each of the eight sessions was mapped onto each of the individual dimensions using Compendium to perform the rankings/mappings and capture rationale for each rating or ranking. Doing this in Compendium provided a visual way to refine, order, and sub-group the different dimensions, using the following criteria:

- Characterize where each session lay along the high-to-low (or other values) for that dimension
- Give a justification/rationale for why a session received a value, captured as a Pro
- Array all eight of the sessions along the 'axis' for that dimension, generally with the 'high' at the top of the map and 'low' at the bottom

- Add rationale for each ranking and, for some, example artifacts, such as screenshots, photos, or transcript quotes[11]

Once the general rankings were assigned, the each category, dimension, and session were arrayed in tables with each session color-coded (for example, blue for AG1, orange for the Hab session, and so on) to look for any emerging patterns. Where the dimensions were simple groupings rather than rankings (such as dimension A.1, which shows the practitioner choice of method), the groupings were depicted rather than a high-to-low array. Reviewing the tables led to observations about how the dimensions themselves could be further grouped in composite categories, as will be shown in Chapter 8.

## 4.8 Chapter summary

This chapter has reviewed the approach taken to choose the studied practitioners and research settings, gather data, and analyze it in order to develop the findings that will be presented in the following chapters. It began by describing the principles of qualitative research that guided the methods employed in this thesis, followed by tracing the evolution of the analysis techniques over three rounds of iteration. It described the selection of sessions and settings and reviewed the way practitioner diversity was assessed. It described the practice task given to the non-expert practitioners in Round 2, and concluded by giving detailed descriptions of the individual analysis techniques and the comparative analysis approach.

The analysis focused on characterizing how the choices made by practitioners in their preparation period were enacted during the group sessions. Using critical incident analysis, moments where practitioners were faced with some kind of anomaly in the course of a session were selected for closer analysis, looking at the specific practitioner moves and choices that determined the outcome

[11] Web exports for all of the Compendium maps for the comparative analysis are available at http://people.kmi.open.ac.uk/people/selvin/analysis

of the sensemaking moment, focusing on the aesthetic, ethical, improvisational, and narrative aspects of those moves and how these contributed to the ways in which participants engaged with the representation, with special emphasis on the character of the real-time shaping of the representation. Through repeated viewings of the video data, examination of the questionnaire results, application of the analytical instruments, and comparison of all of these sources, a set of explanatory concepts, categories, and properties was developed, focusing on the engagement of both practitioner and participants with the hypermedia representation.

The following four chapters describe the findings from this analysis.

- Chapter 5 compares results from the questionnaire data and traces characteristics across the sessions
- Chapter 6 contains comparisons of shaping behavior across the sessions, such as the interaction of participants with practitioners and representations as well as the actions and consequences corresponding to the Framing categories described in Chapter 2
- Chapter 7 focuses on the sensemaking moment analysis, examining practitioner sensemaking behavior, such as the types of sensemaking moments encountered and the categories of response types
- Chapter 8 discusses these findings

Taken together, they report the key similarities and differences emerging from the analysis described in this chapter, and begin to answer questions about what accounts for them. They stress comparative criteria that differentiate sessions, practitioners, and specific practitioner moves and choices. Chapters 5 through 7 each open with an illustrative example tracing data from an individual session from source data through to the comparative analysis artifacts.

As the thesis has stressed to this point, a central goal of this research is helping people engage in collaborative representations as a way of making meaning together. Shedding light on facilitative practitioner actions, sensemaking, and effectiveness, requires understanding all three in context. Special emphasis is put on the ways that facilitative visual representations become coherent (clear, expressive, evocative, informative), engaging (compelling enough to pay attention to and involve in a session's communicative discourse) and useful (applicable to and supportive of the reason participants are working together, their end product and goal).

The findings presented derive both from "grounded," bottom-up data, themes and categories that emerged from observations, and "top-down" analysis, analysis that started from the Framing model and conceptual framework and examined the video and questionnaire data to see if the top-down phenomena could be discerned. Data are examined at both "whole session" levels, comparing summative characteristics of the sessions with each other, and at the level of specific events, moves, and practitioner choices within the sessions, often those performed by an individual such as a mapper or a facilitator.

# 5 Comparative analysis from the questionnaire data

This chapter contains general comparisons of the sessions based on the self-reported questionnaire data, with emphasis on what criteria appear to distinguish the expert practitioners from those with lower levels of skill and experience.[12]

The chapter opens with an illustrative example that shows how data gathered from one of the studied sessions was aggregated with those from the other sessions. The questionnaire was intended to capture the diverse levels of skills and professional experiences among the studied practitioners, emphasizing their varying levels of expertise and background knowledge, especially with regard to facilitation experience, Compendium use, and software proficiency.

## 5.1 Illustrative example: Rutgers Group 2 (RG2)

To give context to the aggregate comparisons that follow, this section describes salient characteristics of one of the sessions, demonstrating how the questionnaire data describing that session's practitioners, appear in the context of the aggregated data. This section describes the RG2 session and traces data from the questionnaire from raw data through its appearance in the aggregated analysis artifacts described later in this chapter.

[12] Additional details about the individual sessions, including a general description of the session and its participants, focusing on intended and actual representational shaping as well as sensemaking triggers and resolutions, can be found http://people.kmi.open.ac.uk/selvin/data/SessionDescriptions.htm.

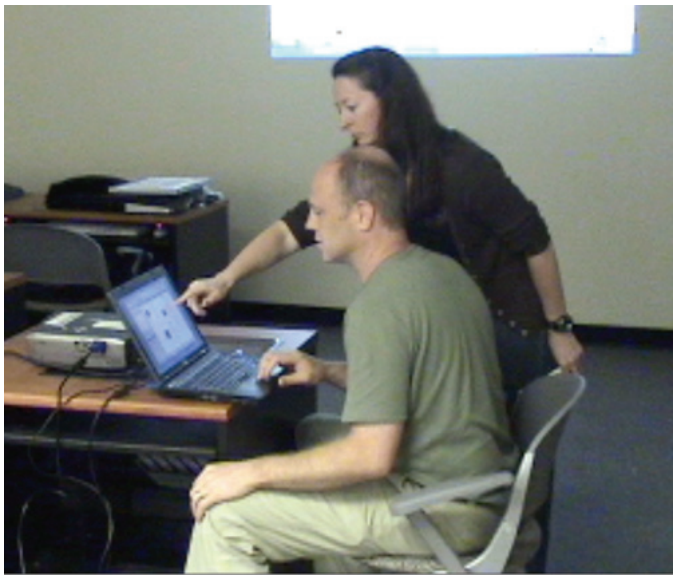


**Figure 5.1: RG2's mapper and facilitator working together during the large group session**

### 5.1.1 Description

In RG2's large group session, two of the members (S.[13] and L.) acted as facilitators and stood in front of the room for the session; another (M.) acted as mapper and sat at the keyboard of the computer hooked to a projector displaying the Compendium maps on a large screen.

#### 5.1.1.1 Planning session

In their small group planning session, the practitioners set up a carefully planned exercise, with clearly assigned roles and a process, documented in handwritten notes that L. kept (and referred to throughout the live session) as well as in a Compendium map. They planned the session to have two main parts. The first would be to show the participants a few pre-selected images of the space program or related ideas, and ask each to provide one "memory" that the image evoked. These would be captured and represented as individual nodes linked to the image on the map. In the second part, the participants would be asked to say how some of the memories related to each other (i.e. provide thematic grouping), that the practitioners would represent as tags applied to each

[13] S. left before the session was over, and before the questionnaires were given out. No response data for S. is included in the analysis.

of the relevant memory nodes. They planned a third phase as well, that would compare the different thematic groupings to each other (they ran out of time for this in the actual large group session).

#### 5.1.1.2 Large group session

Participants were highly engaged in the exercise throughout the large group session. They all knew each other well so part of that engagement was their usual familiarity, but they also started right in trying to engage with the exercise as intended. There was some initial confusion about how the younger participants could provide memories for events (the Apollo moon landings) that happened before they were born, but that was quickly overcome. Each participant appeared to be paying close attention to both the maps and each other's contributions throughout, at times launching animated discussions about someone's contribution or their thoughts about it that at times detracted from a focus on the screen (with a good deal of joking and laughter), but they were willing to be brought back to focus on the intended activity. Both the first and second activities had a high level of participant focus and engagement, except for a few moments when the practitioners got behind or temporarily stymied by their unfamiliarity with aspects of the software, and the side discussions took over for the participants.

The faciliator, L., intervened throughout the session to keep the activities on track, asking clarifying questions and managing the turn-taking, bringing the attention of the participants back to the activity and to the projected maps, and helping the mapper when he got behind. Both facilitator and mapper were highly engaged with maps, subject matter, participants, and process, even environment when some minor technical issues associated with the mapping arose. L. appeared to be paying very close attention to the interaction of all the factors and people, and was very closely concerned with the intended process, the clarity of the representation, and the engagement of the participants with both process and representation.

The mapper, M., played a very similar role to L. He also interacted freely with the participants, clarifying the intended activities when needed, and asking for additional information and validation

of how he had captured their contributions. He was most closely concerned with the proceedings as he represented them on the maps, and worked closely with L. when things got slightly off track a couple of times.

### 5.1.2 Questionnaire responses – skills and experience

This section shows the responses of the two principal RG2 practitioners to the numeric and demographic sections of the questionnaire. Table 5.1 shows the raw responses, followed by graphs showing how the responses compared to those of practitioners from the other groups studied.

**Table 5.1: Rutgers Group 2 questionnaire responses**

| Question | L. (facilitator) | M. (mapper) |
|---|---|---|
| 1. How long have you been using Compendium? | 1mo-1yr | 1-2yr |
| 2. How long have you acted as a facilitator of groups *in any capacity, whether or not using software*? | >5yr | >5yr |
| 3. How long have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Decision Explorer, GroupSystems, etc.) in a shared display*? | >5yr | >5yr |
| 4. How long have you acted as a facilitator of groups *using Compendium in a shared display*? | 1mo-1yr | 1mo-1yr |
| 5. How many times or sessions have you acted as a facilitator of groups *in any capacity, whether or not using software*? | >50 | 21-50 |
| 6. How many times or sessions have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Explorer, GroupSystems, etc.) in a shared display*? | >50 | 6-20 |
| 7. How many times or sessions have you acted as a facilitator of groups *using Compendium in a shared display*? | 1-5 | 1-5 |
| 8. What is your preferred software for group facilitation (if any)? | No preference at the moment - use whatever is appropriate for given context | Compendium, FacilitatePro, GroupSystems |
| 9. How would you describe your skill level with *knowledge mapping / concept mapping software of any kind, (e.g. Compendium, CMapTools, MindManager, etc.)*? 1-5 | Med | Med |

| Question | L. (facilitator) | M. (mapper) |
|---|---|---|
| 10. How would you describe your skill level with the *Compendium* software? 1-5 | Med Low | Med |
| 11. How would you describe your skill level as a group facilitator? 1-5 | Med High | Med High |
| 12. How would you describe your level of technical proficiency with software, in general? 1-5 | High | Med High |
| 13. How familiar are you with hypermedia and hypertext concepts? | Med High | Med |
| 14. In today's event, what role(s) did you play in the *small group planning session*? | Other | Mapper |
| 15. How satisfied were you with the results of the *small group planning session*? 1-5 | High | High |
| 18. In today's event, what role(s) did you play in the *large group session that your group facilitated*? | Facilitator | Mapper |
| 23. Are you (circle one): Female=1,Male=2 | Female | Male |
| 24. What is your nationality? | USA | USA |
| 25. What is your profession? | Consultant, PhD student | Professor |

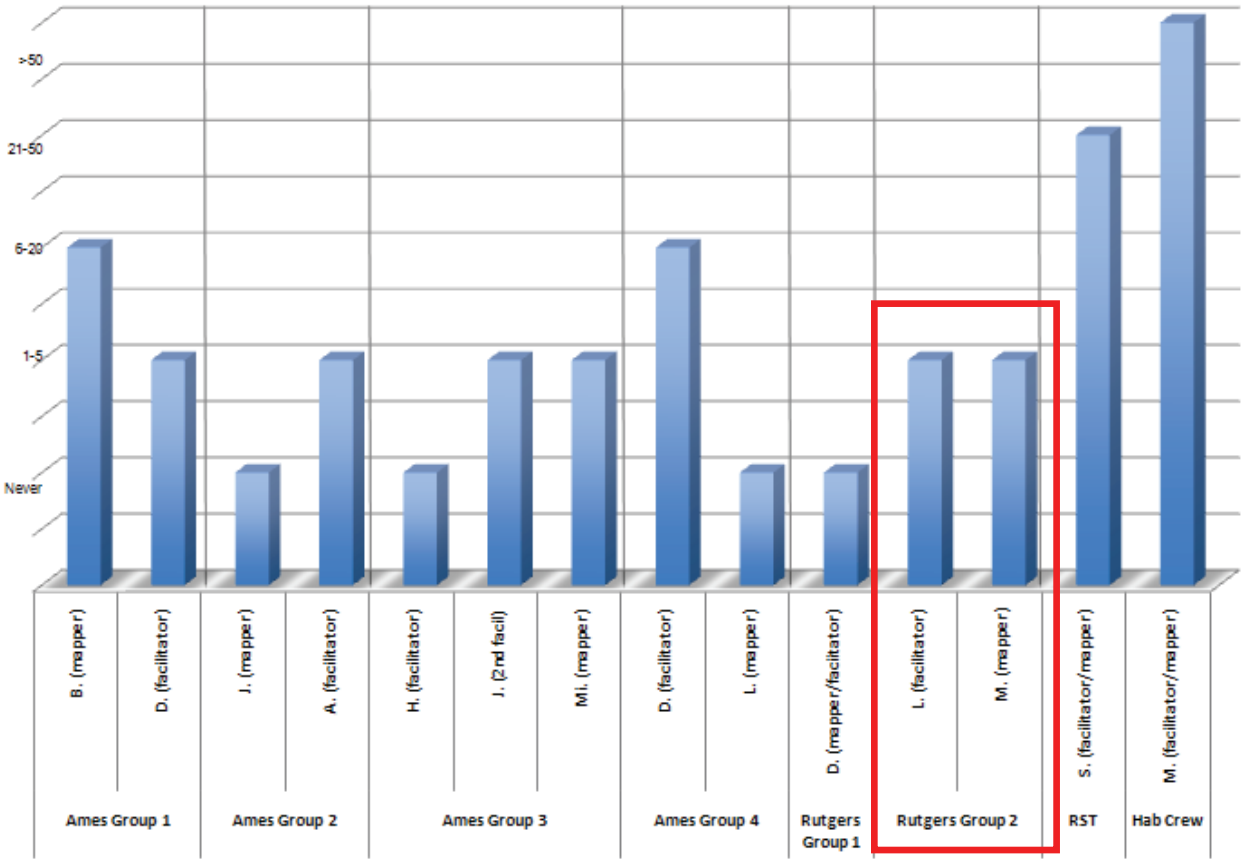



**Figure 5.2: RG2's questionnaire responses to "Frequency of acting as a facilitator of groups using Compendium in a shared display", in comparison to the other groups studied**

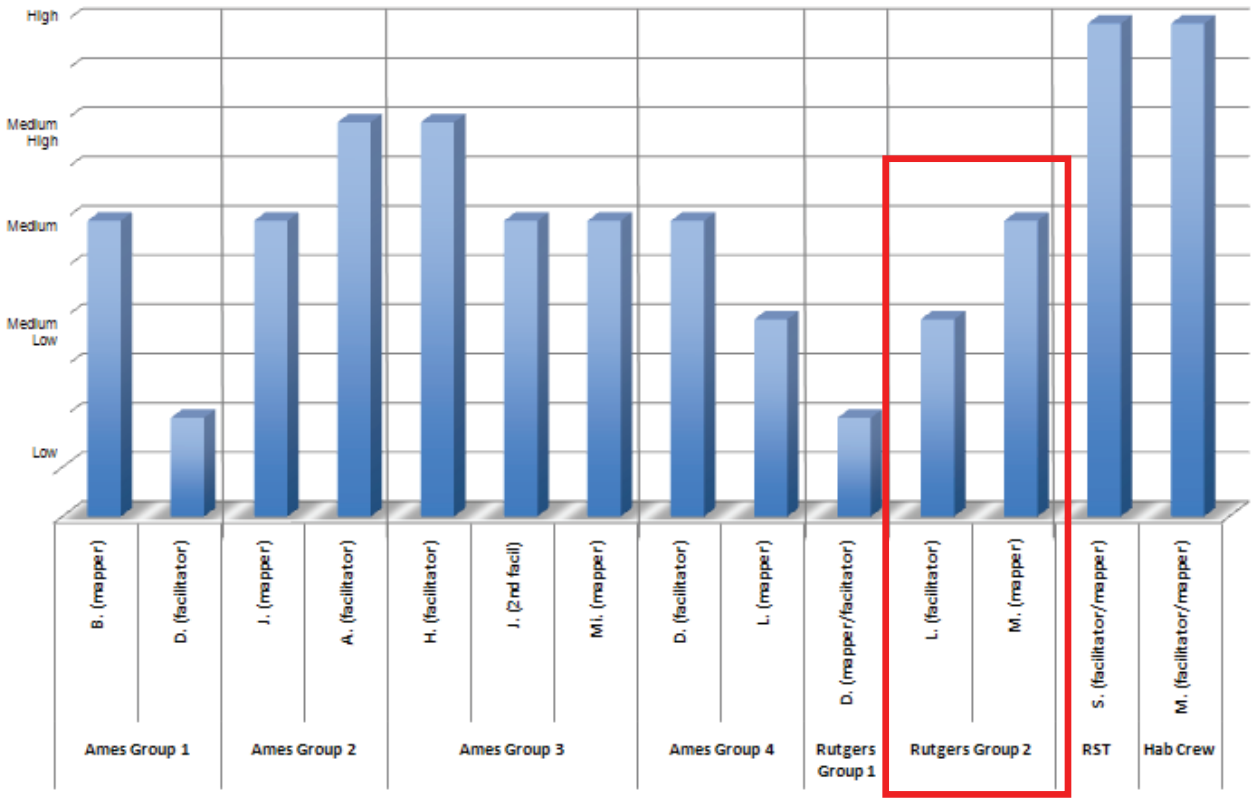



**Figure 5.3: RG2's responses to "Skill level with Compendium" , in comparison to the other groups studied**

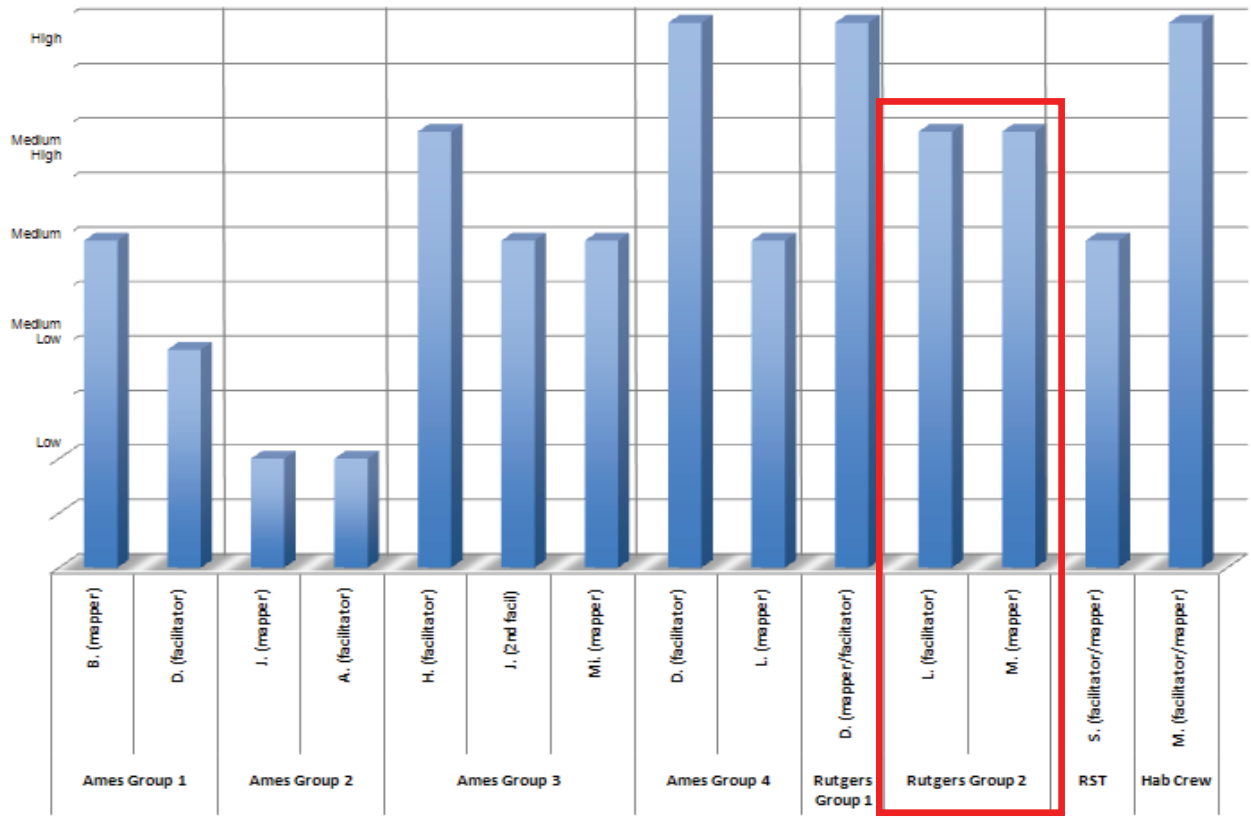



**Figure 5.4: RG2's responses to "Skill level as a facilitator" , in comparison to the other groups studied**

### 5.1.3 Discussion

Although both practitioners reported their facilitation skill level as Medium High (see Figure 5.4), which was higher than most of the studied practitioners, they rated their general skill level with Compendium as Low and Medium Low (see Figure 5.3), lower than most. Each RG2 practitioner reported five or fewer experiences using Compendium facilitatively (see Figure 5.2). This was lower than the leading practitioners from the RST, Hab, and AG2 sessions, but comparable to most of the other practitioners studied. Overall, these indices establish the RG2 practitioners as bringing average facilitation skill.

The collectively high level of software and facilitation background and skills amongst the practitioners was manifested in both the relative complexity of the planned exercise (using more advanced Compendium techniques such as multiple tagging of nodes), and in their ability to work together to catch up without losing control of the session or the representation, as well as the

facilitator's ability to intervene and interrupt side conversations to bring things on track without disrupting the overall mood, and her repeated physical directing of attention to specific areas of the screen to invite validation from participants of both her textual summaries, and graphical connections in the map. They were able to recover well from what M. the mapper described in his questionnaire comments as "inherent ambiguity" in the way they presented the exercise to the participants. In the words of L., the facilitator:

> Actually I thought it went better than we thought it would - there were some things we sort of left 'open' so that was interesting to see the actual practice. In doing the exercise, I realized we had not predefined what to do with certain types of responses (e.g. - "no memory").

This section has gone into some detail on RG2, in order to exemplify how the summarized questionnaire data, discussed in the rest of this chapter, is grounded in the detailed responses for one of the studied sessions. The following sections describe the aggregated questionnaire data and show how all of the sessions were characterized and compared using them.

## 5.2 Skill and experience diversity of studied practitioners

The questionnaire was designed to create a profile of the studied practitioners, with the intent of gauging both similarities and differences among the sample. Of special interest were the degree of applicable skills and experience to the act of creating facilitative visual representations. Each group's responses to each questionnaire item are graphed in Appendix 11.2.[14]

The data show, within some boundaries, both similarities and differences among the sample. Given the small size of the sample and the limited set of locales from which they were drawn, in general,

[14] Practitioner free-text comments entered on the questionnaire can be found at http://people.kmi.open.ac.uk/selvin/data/PractitionerComments.htm.

facilitation and software experience was higher among the respondents than what might be expected from the general population, given the respondents' background, interests, and professional or academic affiliations. Nearly the entire sample had some degree of facilitation experience (though higher without software tools than with) and a fairly high level of applicable software skills and experience, though the two expert practitioners had higher levels of both.

The data show their suitability to the assigned facilitative task. This group of people could be expected to understand what it means to shape a facilitative representation using software (more so than the general population, which (though not studied in this research) can be assumed to generally have lower levels of software and facilitation skills and experience than this study's respondents). With their degree of experience, they would be able to at least attempt to do so effectively in the studied sessions, within the bounds of their practice situation, and should demonstrate a range of levels of success and effectiveness in their attempts.

Table 5.2 shows a ranking of the twelve software skill and experience categories from the questionnaire data. The categories with the greatest differences between the expert and non-expert practitioners are ranked highest. The ranking shows the greatest areas of difference are in the facilitative use of software in general, and with Compendium in particular. The lowest areas of difference are in familiarity with hypertext and hypermedia, experience as a facilitator in general, and technical proficiency with software. Thus one may expect the strongest differences in the observed sessions to be in dimensions reflecting specific skills with software-based facilitation, especially with Compendium, where general facilitation experience and technical proficiency should not be as important as differentiating factors.

**Table 5.2: Software skill and experience categories, ranked by expert/non-expert differences**

| Category | Non-Expert Practitioners | Expert Practitioners | Difference |
|---|---|---|---|
| Length of time as a facilitator using Compendium | 2.17 | 6.00 | 64% |
| Frequency as a facilitator with Compendium | 1.83 | 4.50 | 59% |
| Length of time as a facilitator using any software | 2.83 | 6.00 | 53% |
| Frequency as a facilitator with any software | 2.33 | 4.50 | 48% |
| Skill level with knowledge/concept mapping software | 2.67 | 5.00 | 47% |
| Skill level with Compendium | 2.67 | 5.00 | 47% |
| Length of time using Compendium | 3.58 | 6.00 | 40% |
| Familiarity with hypertext/hypermedia concepts | 3.58 | 5.00 | 28% |
| Length of time as a facilitator, with or without software | 4.42 | 6.00 | 26% |
| Frequency as a facilitator with or without software | 3.33 | 4.50 | 26% |
| Skill level as group facilitator | 3.17 | 4.00 | 21% |
| Technical proficiency with software in general | 4.00 | 5.00 | 20% |

Based on the questionnaire data, there is enough degree of difference among characteristics of the studied practitioners to make the claim that the qualitative analysis reported in this thesis is looking at a sufficiently diverse set of practitioners so as to be of at least limited representativeness (even if making no claims of external validity).

Figure 5.5 shows radar charts with all twelve skill, experience, and proficiency questionnaire responses for each studied session. The larger the "footprint" of the shaded area on a chart, the higher the scores as a whole (larger plots along each axis in the chart indicate higher values). The two expert sessions have the largest such footprints, followed by RG2, AG3, and AG1..

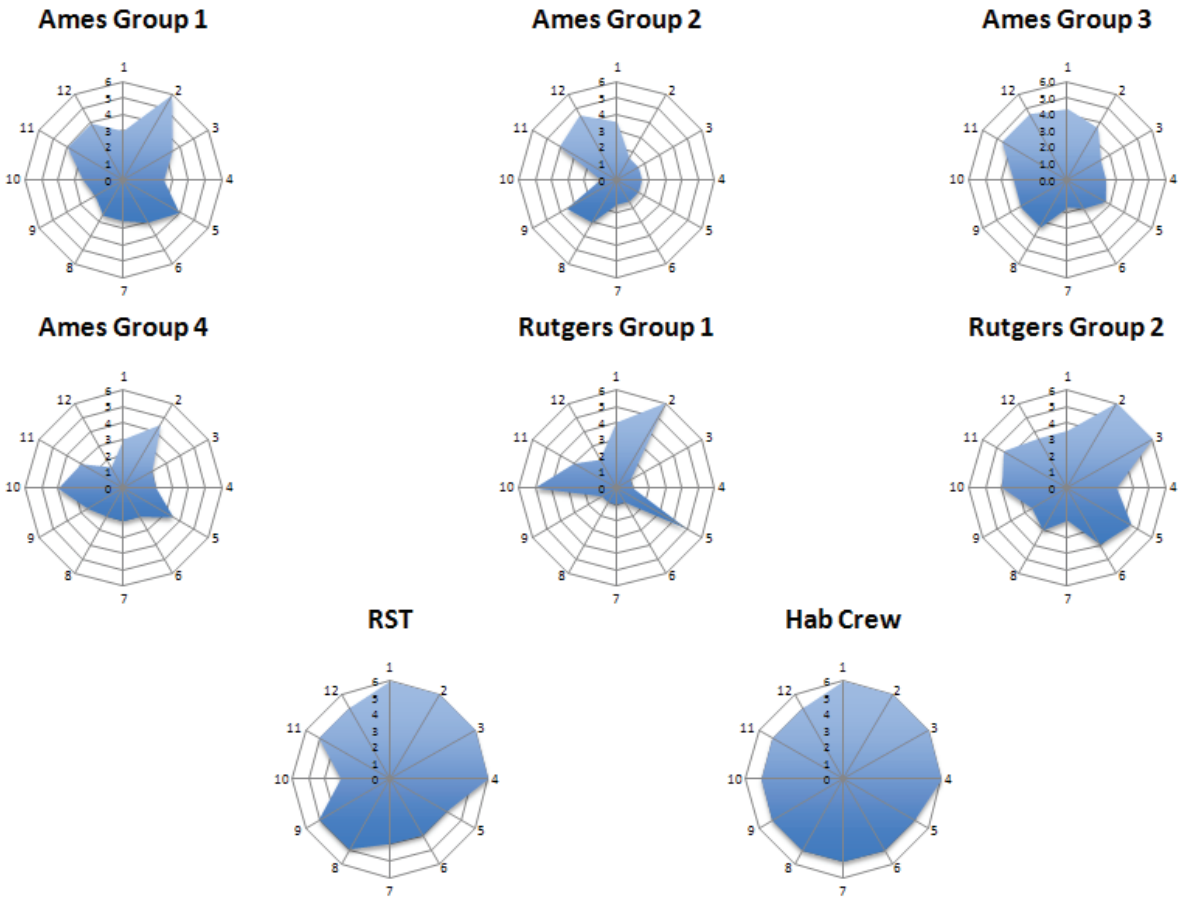



**Figure 5.5: Software skill/experience questionnaire responses for the studied sessions**

**See Table 5.3 for the legend to axes 1-12.**

**Table 5.3: Legend for skill/experience radar charts**

| Axis | Corresponding question |
|---|---|
| 1 | How long have you been using Compendium? |
| 2 | How long have you acted as a facilitator of groups? |
| 3 | How long have you acted as a facilitator of groups *using any kind of software*? |
| 4 | How long have you acted as a facilitator of groups *using Compendium*? |
| 5 | How many times or sessions have you acted as a facilitator? |
| 6 | How many times or sessions have you acted as a facilitator of groups *using any kind of software*? |
| 7 | How many times or sessions have you acted as a facilitator of groups *using Compendium?* |
| 8 | How would you describe your skill level with *knowledge mapping / concept mapping software?* |
| 9 | How would you describe your skill level with *Compendium*? |
| 10 | How would you describe your skill level as a group facilitator? |
| 11 | How would you describe your level of technical proficiency with software? |
| 12 | How familiar are you with hypermedia and hypertext concepts? |

## 5.3 Characteristics across sessions using composites

The previous section emphasized the *overall* characteristics of the expert vs. non-expert practitioners in the studied sessions. This section compares the sessions to one another using *composites* of the questionnaire responses, focusing on the aspects that relate to practitioner skill, experience, and knowledge.

### 5.3.1 Facilitation comparisons

Seven questions from the survey referred to general facilitation skills and experience, listed in Table 5.4. Taken together they indicate a "composite facilitation score," comprising both software- and non-software-assisted facilitation.

**Table 5.4: Questions included in the composite facilitation score**

| |
|---|
| 2. How long have you acted as a facilitator of groups in any capacity, whether or not using software? |
| 3. How long have you acted as a facilitator of groups using any kind of software (Compendium, MS-Word, MindManager, Decision Explorer, GroupSystems, etc.) in a shared display? |

| |
|---|
| 4. How long have you acted as a facilitator of groups using Compendium in a shared display? |
| 5. How many times or sessions have you acted as a facilitator of groups in any capacity, whether or not using software? |
| 6. How many times or sessions have you acted as a facilitator of groups using any kind of software (Compendium, MS-Word, MindManager, Explorer, GroupSystems, etc.) in a shared display? |
| 7. How many times or sessions have you acted as a facilitator of groups using Compendium in a shared display? |
| 11. How would you describe your skill level as a group facilitator? |

Of these questions, two refer specifically to facilitating with Compendium, shown in Table 5.5, referred to as the "composite Compendium facilitation score."

**Table 5.5: Questions in Compendium composite facilitation score**

| |
|---|
| 4. How long have you acted as a facilitator of groups using Compendium in a shared display? |
| 7. How many times or sessions have you acted as a facilitator of groups using Compendium in a shared display? |

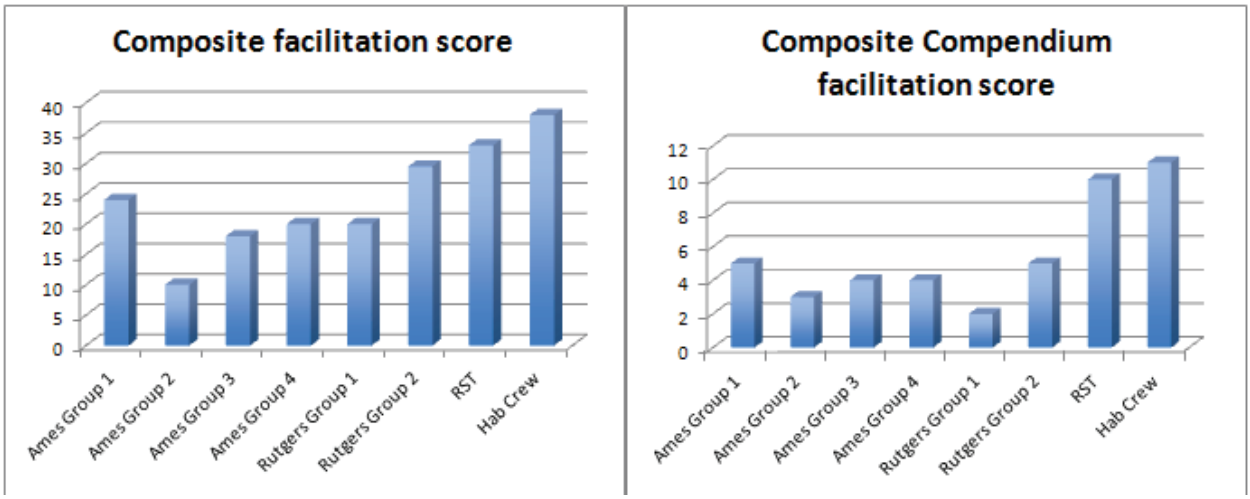



**Figure 5.6: Comparison of composite facilitation scores**

Figure 5.6 above and Table 5.6 below show the distribution of responses across the studied sessions' practitioners for the composite facilitation scores, and the subset of questions that represent the composite Compendium facilitation score. The two expert sessions, RST and Hab, show higher levels of both the general and Compendium facilitation, with the Compendium-specific composite showing

more dramatic differences (the scores for both expert sessions are double those for the closest non-expert practitioners from the RG2 and AG1 sessions).

**Table 5.6: Cross-session comparison of facilitation skills/experience**

| Session | Composite facilitation score | Composite Compendium facilitation score |
|---|---|---|
| **Hab Crew** | 38.0 | 11.0 |
| **RST** | 33.0 | 10.0 |
| **Rutgers Group 2** | 29.5 | 5.0 |
| **Ames Group 1** | 24.0 | 5.0 |
| **Ames Group 4** | 20.0 | 4.0 |
| **Rutgers Group 1** | 20.0 | 2.0 |
| **Ames Group 3** | 18.0 | 4.0 |
| **Ames Group 2** | 10.0 | 3.0 |

### 5.3.2 Software proficiency comparisons

Five questions from the survey referred to software-related skills and experience, listed in Table 5.7. Taken together they indicate a "composite software proficiency score," comprising both software- and non-software-assisted facilitation.

**Table 5.7: Questions in composite software proficiency score**

| |
|---|
| 1. How long have you been using Compendium? |
| 9. How would you describe your skill level with knowledge mapping / concept mapping software of any kind, (e.g. Compendium, CMapTools, MindManager, etc.)? |
| 10. How would you describe your skill level with the Compendium software? |
| 12. How would you describe your level of technical proficiency with software, in general? |
| 13. How familiar are you with hypermedia and hypertext concepts? |

Of these questions, the three shown in Table 5.8 refer specifically to Compendium software skills and experience, referred to as the "Compendium proficiency score." Note: These questions do not address facilitation experience with Compendium.

**Table 5.8: Questions in composite Compendium proficiency score**

| |
|---|
| 1. How long have you been using Compendium? |
| 9. How would you describe your skill level with knowledge mapping / concept mapping software of any kind, (e.g. Compendium, CMapTools, MindManager, etc.)? |
| 10. How would you describe your skill level with the Compendium software? |

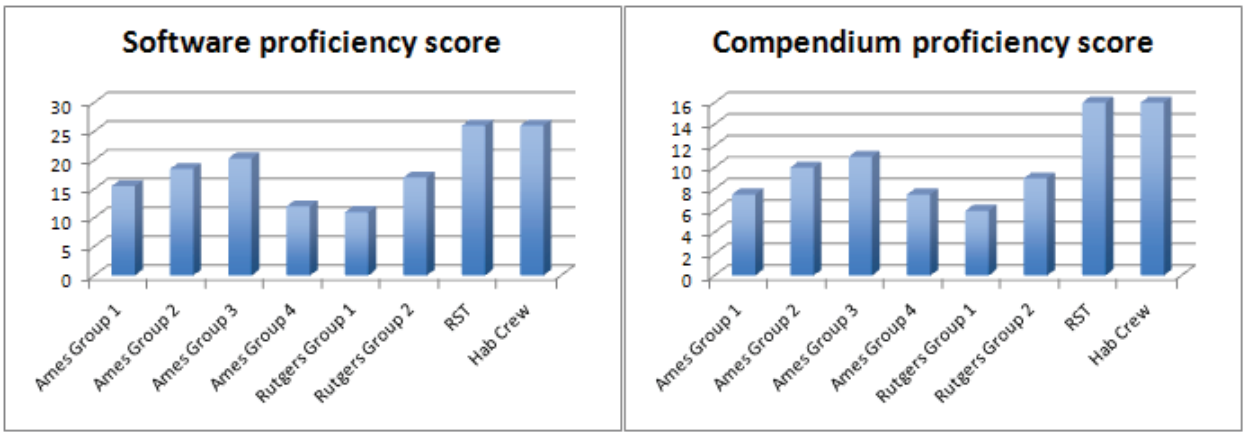



**Figure 5.7: Comparison of composite software and Compendium proficiency scores**

Figure 5.7 above and Table 5.9 below show the distribution of responses across the studied sessions' practitioners for the composite software proficiency scores, and the subset of questions that represent the composite Compendium proficiency score. As with the facilitation scores, the two expert sessions, RST and Hab, show higher levels of both the general and Compendium facilitation, with the Compendium-specific composite showing more dramatic differences (the scores for both expert sessions are double those for the closest non-expert practitioners from the RG2 and AG1 sessions). The expert/non-expert differences in Compendium software proficiency, however, are not as dramatic as they were for Compendium facilitation proficiency, indicating that Compendium software skills themselves may not be as significant a differentiator as Compendium facilitation skills.

The non-expert sessions rank differently between the facilitation and software composites. The highest-ranked non-expert session practitioners for the facilitation composites were RG2, AG1, and AG4. However, the highest-ranked non-expert session practitioners for the software composites

were AG3, AG2, and RG2. As will be discussed in Chapter 8, the differences in facilitation and software proficiency do explain some of the variance in the sessions observed in the qualitative analysis.

**Table 5.9: Cross-session comparison of software proficiency**

| Session | Software proficiency score | Compendium proficiency score |
|---|---|---|
| **RST** | 26.0 | 16.0 |
| **Hab Crew** | 26.0 | 16.0 |
| **Ames Group 3** | 20.3 | 11.0 |
| **Ames Group 2** | 18.5 | 10.0 |
| **Rutgers Group 2** | 17.0 | 9.0 |
| **Ames Group 1** | 15.5 | 7.5 |
| **Ames Group 4** | 12.0 | 7.5 |
| **Rutgers Group 1** | 11.0 | 6.0 |

## 5.4 Chapter summary

This chapter opened with an illustrative example of the self-assigned practitioner skill and experience ratings and characterizations of their small group planning and large group sessions. It then presented general comparisons of the sessions based on the self-reported questionnaire data. The data characterized the sessions by experience and proficiency criteria.

The questionnaire data show diversity in the skill and experience levels of the studied practitioners in the areas of facilitation, concept and knowledge mapping, and Compendium use, leading to a claim that the studied sessions represent a range of situations rather than a uniform set. The data show strong contrasts between the expert practitioners in the Hab and RST sessions and the less expert or novice practitioners in the other sessions. Compendium-based facilitation skills and experience were the largest point of differentiation, with general facilitation skills and software proficiency being the lowest. The composite data showed that the specific considerations involved in

facilitating with the Compendium software as the chosen medium could be expected to be more of a differentiator in practitioner performance and effectiveness than technical competence.

In terms of the research questions described in Chapter 1, this chapter lays some of the groundwork by which the kinds of comparisons described in RQ1 can be made (*RQ1: How to characterize and compare the interactions of specific representational situations and practitioner actions?)*. Practitioner skill and experience levels prior to an instance of practice set the stage for the more experiential, qualitative kinds of comparisons that follow. As will be seen in Chapter 8, the "demographic" kinds of comparisons discussed in this chapter can be correlated with the other forms of analysis to yield a nuanced picture of how instances of practice compare to each other along the experiential lines called for in all four RQs.

Having characterized groups in terms of questionnaire response profiles, the following chapter describes the comparative categories and dimensions that arose from 'bottom-up' analyses of the individual session analyses, followed by a more 'top-down' comparative analysis derived from the Framing model introduced in Section 6.6.

# 6 Shaping and Framing analysis

This chapter describes the primary findings from the qualitative analysis. As described in Chapter 4, the individual analyses for each of the sessions were analyzed and common themes (dimensions) identified where the same types of situations, issues, or concerns occurred in all or most of the sessions, corresponding to the key concerns identified in Chapters 1 through 3. Of special concern are the ways in which the components of the theoretical framework discussed in Chapter 2 (aesthetics, narrative, improvisation, sensemaking, and ethics) found expression in the actual instances of practice, and the building up of a multi-perspective experiential view on practitioner action, as called for by many of the researchers discussed in Chapter 3.

The chapter opens with an illustrative example of how a single session was studied with the five types of analytical tools described in Chapter 4, culminating in characterization of practitioner actions according to a set of qualitative dimensions. In all 35 dimensions were identified, which were grouped into five categories:

- **Category A: Conducting.** Aspects of the sessions themselves, such as ways to characterize their overall context, tone, or character
- **Category B: Planning.** Aspects having to do with initial plan and other pre-session factors such as characteristics of practitioners' chosen method and approach
- **Category C: Relating.** Aspects that describe the practitioners' interpersonal interaction with participants and their communicative styles
- **Category D: Shaping.** Aspects of the shaping of the representations themselves, and factors that went into the physical and conceptual shaping of the representational material
- **Category E: Framing.** Aspects that directly relate the sessions to elements of the normative framework discussed in section 2.2.5.2.

Sections 6.2 through 6.6 describe each of the categories and dimensions in more detail, and analyze how the sessions were grouped, rated, and ranked within each theme. Each of the sections begins with a general description of that category and its dimensions, focusing on the common elements of the dimensions that led to them being grouped in that category. Then each dimension is treated individually. These sections first indicate where each studied session was ranked, rated, or grouped within the dimension, and then discuss the placing of the dimension within Chapter 2's conceptual framework. Following this, examples are given to illustrate the rankings and ratings, focusing on how specific observed behaviors or events in the sessions exemplify aspects of the dimension. Where appropriate, artifacts from the sessions themselves, such as screenshots, photos, or transcript excerpts, are presented as illustrations of the behaviors.

## 6.1 Illustrative example: Hab

In order to ground the aggregate comparisons later in the chapter, this section describes the Hab session and shows how portions of the individual analyses of that session contributed to the comparative dimensions described in sections 6.2 through 6.6.

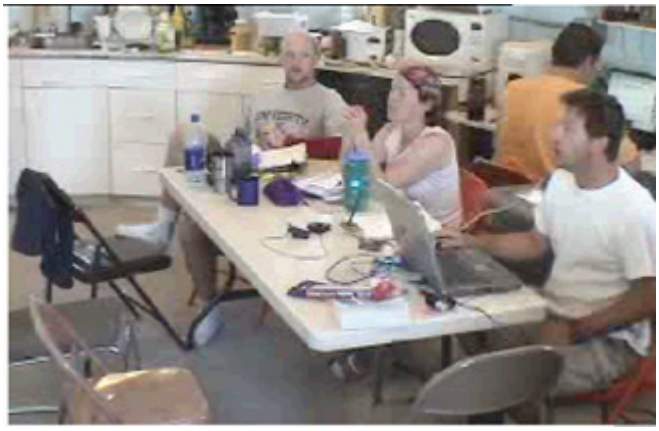


**Figure 6.1: Hab crew practitioner and participants during their session, looking toward the projection screen**

### 6.1.1 Description of the session

This section extends the introductory description provided in section 4.3.1.

#### 6.1.1.1 Practitioner roles

The Hab session was a face-to-face meeting in the Mars Desert Research Station Habitat in the Utah desert, employed by NASA for field trials. Video data came from a recorded screen on the practitioner's laptop showing Compendium and other tools (projected as a shared display), plus a video recording of the participants working together with the facilitator. There were two participants and one practitioner. The participants, A. and B., were both geologists responsible for planning and carrying out the field surveys (known as EVAs) and geological analyses. The practitioner, M., who was also a member of the larger project team, acted as facilitator for the whole session. He performed the Compendium mapping as well as pulling up reference materials (for example, a scan of a hand drawn map of the area they were planning for) in Microsoft Photo Editor as necessary. Much of the hour-long session was spent examining and discussing the map. The main Compendium activity (which continued to be interspersed with references to the hand-drawn map) started at about 24:15 of the video recording. M. was engaged in the subject matter and aspects of the planning from the perspectives of technical expert and mission team member. He participated fully in most of the discussion, although clearly the two geologists were responsible for the specifics of the contributed content. The total session lasted about 55 minutes.

The session was tightly planned in advance, with an agenda and links to previously prepared materials. It followed a similar form to earlier meetings in the Mobile Agents project that had also been conducted with Compendium. The main goal was to develop and capture specific planning items for the next EVA, particularly where the robotic rover was to take photos and what to call those locations, and other aspects of the geologists' planned activities during the EVA. Figure 6.2 shows the agenda map created before the start of the session, including an image of the "hand-drawn map."

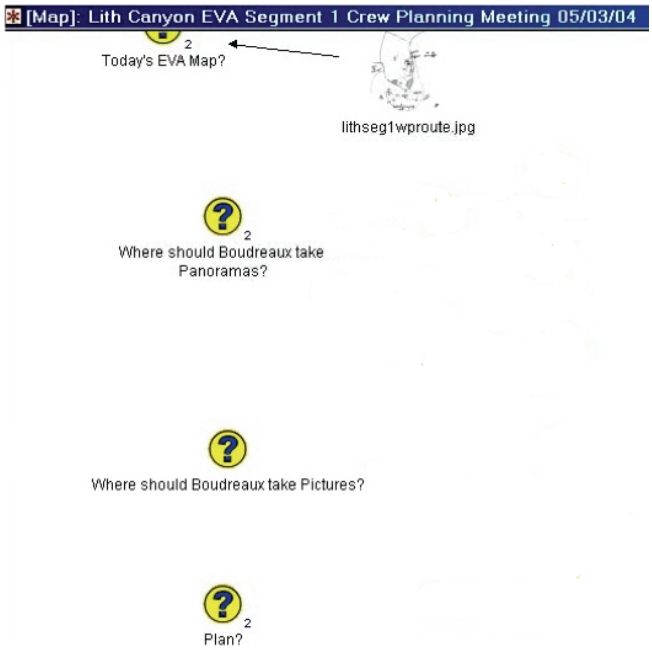



**Figure 6.2: The Hab session's pre-created map, showing the Question nodes serving as agenda items**

#### 6.1.1.2 Participant and practitioner engagement

The participants, A. and B., were highly engaged throughout the session, both in contributing content, validating how M. represented things, making suggestions for new directions, and collaborating on navigation and retrieval of previous material when necessary.

M. was also deeply engaged throughout. He exhibited a high degree of skill and familiarity with the software, attending diligently to the details and the need to capture and represent the participant contributions succinctly. He deflected interruptions swiftly and kept the proceedings close to intended purpose and timeline.

#### 6.1.1.3 Shaping activities and issues

Since the purpose of the session was to explore options and make decisions, with Compendium providing the means to capture deliberations and retrieve relevant science data, the shaping during the session consisted primarily in capturing the relevant aspects of the Hab crew discussion and representing it as succinct nodes (contributions to the discussion), linked to key questions. There

were several times near the end of the session where complex navigation and retrieval activities were needed in order to find older material for embedding in the main map. The display was kept clean and its textual content succinct.

The graphical and hypertextual shaping was done by M., with nearly all content contributed by the participants. A. and B. provided extensive review and validation as well as suggestions for additional topics and directions to find previous material.

Much of the shaping was within the scope of the pre-planned agenda except for the emergence of the 'sample bag nomenclature' topic. The textual shaping was mostly done by M. capturing the exact text of the participant verbal contributions, but some was suggested directly by the participants.

There were no technical or procedural obstacles during the session, only a few very temporary hiatuses that were swiftly resolved through either collaborative navigation or quick problem-solving by M. (e.g. when he had brief trouble linking a group of nodes).

#### 6.1.1.4 Discussion

M. was highly skilled both in guiding the group, and in his fluid and expressive use of the software to create clear and useful representations that his participants were deeply engaged in, as well as both being capable of executing complex operations rapidly and with little disruption to the process. The Hab Crew session is notable in the studied sessions in the exceptionally high degree of isomorphism between purpose, process, and representation. The participants seamlessly interacted with each other, the practitioner, and the representation, and there was complete engagement with the representation throughout. The representation itself never deviated from being the focal point and purpose of the session (unlike many of the other sessions, in which participant attention to the representation varied greatly in intensity and duration).

### 6.1.2 Analysis artifacts

This section presents excerpts from the ways that the Hab session was studied using the five analysis tools. The excerpts selected focus on two aspects of the session: the degree and quality of the collaboration between practitioner and participants, and the particular character of the hypertextual shaping that occurred in the session.

#### 6.1.2.1 Shaping form

Recall (section 4.6.1) that the *Shaping form* characterizes the Hab session as a whole, highlighting broad shaping behavior. Figure 6.3 shows a portion of the form that describes the quality of engagement of Hab practitioner and participants during the session, as well as the general character of the representational shaping that occurred. The indented sections describe specific data from the session, while the questions are generic components from the Shaping form itself, applied to all of the studied sessions.

What was the level and quality of participant engagement? (with map(s), subject matter, process, environment)

> The participants were highly engaged throughout the session, both in contributing content, validating how M. represented things, making suggestions for new directions, and collaborating on navigation and retrieval of previous material when necessary. There were some interruptions to the process from other team members not participating in the session; M. dealt with these swiftly and kept the meeting on track.

What was the level and quality of facilitator engagement? (with map(s), subject matter, participants, process, environment)
What was the level and quality of mapper (if different person than facilitator) engagement? (with map(s), subject matter, participants, process, environment)

> M. was deeply engaged throughout. He was steeped in the subject matter and intended use (being one of the downstream 'users' of the info himself thus was able to see implications and importance of different issues and contributions. He exhibited a high degree of skill and familiarity with the software, and kept an unflagging attention to the details and the need to capture and represent the participant contributions succinctly. He deflected interruptions swiftly and kept the proceedings hewing close to intended purpose and timeline.

What types of shaping occurred during the session?

> Primarily capturing the relevant aspects of the hab crew discussion and representing it in nodes, linking them to the relevant questions. There were several times near the end of the session where search/navigation/retrieval in order to find material for transclusions in the main map. The display was kept clean and succinct.

**Figure 6.3: Portion of Hab session Shaping form**

#### 6.1.2.2 CEU analysis

Figure 6.4 shows a portion of the *Coherence/Engagement/Usefulness* analysis (introduced in section 4.6.2) for the Hab session, depicting the events in timeslots 17 through 21 that were later chosen for sensemaking episode analysis (see the following section). It describes how the high degree of collaboration between the practitioner and participants, their close knowledge of the subject matter and their work in Compendium in previous sessions, plus the high degree of practitioner skill in quickly navigating through previous maps, sustained CEU scores at a high level throughout the episode.

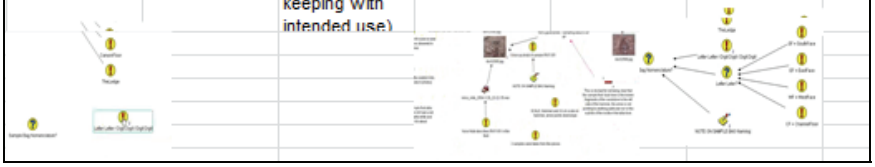
| | | | | | |
|---|---|---|---|---|---|
| Moving on to sample bag nomenclature ("I think we had it" "There it is!" -- successful discovery of previous node through label matching) | Continuing to work on nomenclature, successfully deflected an interruption | M puts in a intermediate question ("Letter Leter") to group these | Brent remembers he has a clarification in a previous map; collaborative navigation; another interruption deflected (in progress) | Successfully deflected the interruption; explanatory note node in other map found and transcluded to main map | |
| 3 | 3 | 3 | 3 | 3 | |
| 3 | 3 | 3 | 3 | 3 | |
| 3 | 3 | 3 | 3 | 3 | |
| **17** | **18** | **19** | **20** | **21** | |
| 27:40 | 28:40 | 29:40 | 30:40 | 31:40 | |
| 50:55 | 51:55 | 52:55 | 53:55 | 54:55 | |
| 50:55 | 51:55 | 52:55 | 53:55 | 54:55 | |
| Bit of struggle to find/clarify previous nomenclature, but then clearly found and validated in one pre-existing node | Workng through and capturing nomenclature items | Not 100% as clear in this TS as others but still makes sense | Able to navigate around to find the missing map and wait for it to open, even with all the complexity | Main map clarified with transcluded node; previous structure from TS19 removed in favor of it | |
| All involved in discussing then validating surprise finding of transcluded node | Same as previous. M deflects an interruption | All engaged | All engaged | All engaged in finding, placing, and validating | |
| Same as previous | Same as previous | Same as previous (a little less than the rest of the session so far, but still in keeping with intended use) | Same as previous | Same as previous | |
|  | | | | | |

**Figure 6.4: Portion of CEU analysis for Hab session, showing collaborative navigation**

### 6.1.2.3 Narrative description of sensemaking moment

Figure 6.5 shows a portion of the *narrative description* (Section 4.6.3) of the sensemaking moment identified in the CEU analysis. The excerpt covers activity in timeslot 18 as the participants provide clarification on aspects of the nomenclature subject matter, and the practitioner makes a shaping move to group the nomenclature nodes under a new Question node, with immediate validation from one of the participants.

**Figure 1: Session at 51:17**

They proceed with this unproblematically, identifying additional names, until M voices some confusion with the naming approach in general:

> [52:15]
> M: "…I don't understand how you use these, but you do, right? It's letter letter? Is that what it is?" A: [52:19-20] "Yeah"
> A: "So our sample bag would be, like, S F slash um 2 1 slash zero 1. And that would be, um"

In the midst of this M. makes an (unprompted) grouping of the nomenclature nodes captured so far, using a Question node:

> M: "So this is letter letter right?"
> A: "Yeah that's all goes there in front of it"
> A: "And then …"

**Figure 6.5: Portion of Hab narrative description of sensemaking moment**

#### 6.1.2.4 Grid analysis

The *Grid analysis* (section 4.6.4) provides a move-by-move delineation of practitioner and participant activity during a session, focusing on the sensemaking moment identified in the previous analyses. The excerpt shown in Figure 6.6 covers portions of timeslots 18 and 19 during a period of intensive, engaged collaboration on identifying and shaping content for the map. The Focus aspects on the right side of the figure show collective concentration on getting the textual details correct on the maps themselves, with the practitioner's direct involvement of the participants through clarifying questions at 52:15 and 52:31.

| Time | | | | | | | | | | | Focus | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start | End | Participant Statement | Practitioner Statement | Participant Engagement with Map | Practitioner Action | Move Type | Activity Type | Stance | Compound Move | Mini-Project | Response / Engagement Mode | Participants | Maps | Text | Subject matter | Surroundings | Process |
| 52:02:00 | 52:03:00 | | | | Drag to select the three nodes just created | Node Select-Multiple | | | | | | | x | | | | |
| 52:03:00 | 52:08:00 | B: "I think that's good so far, the other one is channel four maybe? or" A: "Yeah." | | | | | | | | | | | | | | | |
| 52:04:00 | 52:06:00 | | | | Multi-link all three to "Sample Bag Nomenclature?" | Link-Multiple | | | | | | | x | | | | |
| 52:07:00 | 52:08:00 | | | | Move cursor down and to the right | Cursor Move | | | | | | | x | | | | |
| 52:07:00 | 52:11:00 | B: "CF?" A: "CF yeah cuz it's channel floor or canyon floor it works" | | | | | | | | | | | | | | | |
| 52:09:00 | | | | | Move screen down | Display Move | | | | | | | x | | | | |
| 52:10:00 | 52:17:00 | | | | Create an Answer node and give it the label "CF = ChannelFloor" | Node Create-Answer | | | | | | | x | x | x | | |
| 52:15:00 | 52:20:00 | A: [52:19-20] "Yeah" | "So am I… I don't understand how you use these, but you do, right? It's letter letter? Is that what it is?" | | | Verbal Query | | | | | | x | | x | x | | |
| 52:18:00 | | | | | Link node to "Sample Bag Nomenclature?" | Link | | | | | | | x | | | | |
| 52:19:00 | 52:23:00 | | | | Move cursor over the set of nodes, then to area under "Sample Bag Nomenclature?" | Cursor Move-Placement for Next Move | | | | | | | x | | | | |
| 52:20:00 | 52:30:00 | A: "So our sample bag would be, like, S F slash um 2 1 slash zero 1. And that would be, um" | | | | | | | | | | | | | | | |
| 52:24:00 | 52:34:00 | | | | Create Question node and give it the label "Letter Leter?" [sic] | Node Create-Question | | | | | | | x | x | x | | |
| 52:31:00 | 52:32:00 | | "So this is letter letter right?" | | | Verbal Query | | | | | | x | | x | x | | |

**Figure 6.6: Portion of Hab session Grid analysis**

#### 6.1.2.5 Framing analysis

The final analysis tool applied in the sequence is the *Framing analysis* (section 4.6.5), which characterizes the session in terms of the normative framework described in section 2.2.5.2. The excerpt shown in Figure 6.7 describes how the practitioner's actions aligned with component A.2 of the framework, *"Constructing narratives to account for how the situation arrived at the current pass / breaches in canonicity."* It describes how the narrative framing provided by the surrounding Mobile Agents project in general, and the requirements of EVA planning in particular, as well as the previous history of activities in the Lith Canyon area, influenced the way the session played out. The analysis shows how practitioner actions and interactions with participants can be understood within the way the session occurred in the context of the larger project, and the ongoing collaboration between the specific roles played by practitioner and participants in the session.

| | |
|---|---|
| (A.2) Constructing narratives to account for how the situation arrived at the current pass / breaches in canonicity | • *What is the narrative the practitioner is using to construct the situation?*<br><br>Mostly (nearly all) what information was needed to perform the upcoming EVA effectively (so situating within a narrative of "what does it take to conduct an EVA") as well as the ongoing effort to tie together the data, tools, and concepts associated with the Mobile Agents project. Too, a narrative to do with the unfolding understanding of, and history of previous visits to, the Lith Canyon area as well as the previous meetings of this particular team and the analysis work they had already done. On a lower level, an expectation of how Compendium in particular was supposed to function.<br><br>• *What is its degree of internal consistency?*<br>• *How useful is it?*<br><br>It appeared to be highly internal consistent and useful. The only breaches came between narratives – e.g. the concerns of the particular meeting in the context of the larger project (in the face of the interruptions, determinations of which was more important), as well as the mildly frustrated expectation of how the tool should work to do multiple node linking.<br><br>• *How evocative and inclusive is it?*<br><br>The set of narratives appeared to be inclusive of all that occurred during the meeting (i.e. no problematic breaches). There were several slight fissures between the knowledge (what's obvious to) the geologist participants and that of the practitioner, which were swiftly and collaboratively resolved. |

**Figure 6.7: Portion of Hab session Framing analysis**

### 6.1.3 How the individual session is reflected in the comparative analysis

Having stepped through elements of the individual analyses of the Hab session, the next step is to show how these were reflected in two of the comparative dimensions discussed later in this chapter: *"Granularity of the pre-created structure"* (Section 6.3.3) and *"Hypertextual refinement"* (Section 6.5.3).

#### 6.1.3.1 Granularity of pre-created structure

Figure 6.2 showed the map that the practitioner had created before the start of the Hab session, intending it to serve as the working agenda for the meeting, as described in the Shaping Form

analysis. Although there are only a few nodes and links present in that map, it was itself part of a highly complex pre-created structure that contained maps created and modified throughout the Mobile Agents project, with extensive cross-referencing. In performing the comparative analysis for all of the studied sessions, it was noticed that the sessions varied widely in the number, complexity, and arrangement of the nodes and links in their pre-created maps. This led to the identification of the *"Granularity of the pre-created structure"* dimension. Figure 6.8 shows how the Hab session compares to the other sessions for this dimension.

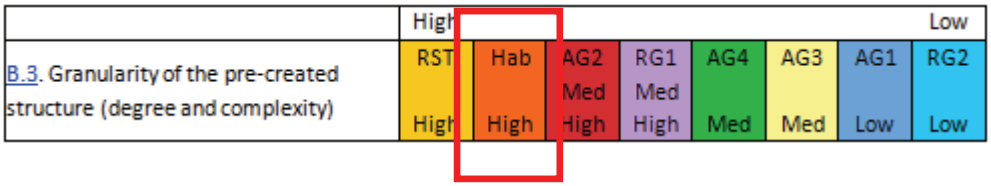



**Figure 6.8: Rankings and ratings for Granularity of pre-created structure**[15]

Figure 6.9 shows how the rationale for these comparative rankings was developed. Using Compendium as an analysis tool[16], each of the sessions was given a ranking and a rating, followed by a statement of why the particular ranking and rating was assigned. In this case visual exhibits were also provided, showing map excerpts with the pre-created structure visible (portions of it, in the case of the Hab session). The red rectangle highlights the portion of the comparisons showing the ranking, rating, rationale, and exhibit for the Hab session.

[15] In this figure, as in each of the similar figures in the rest of this chapter, each session was given an identifying color to make it easier to see where the sessions compared to each other when several dimensions are arrayed next to each other. For example, RG2 is always blue, AG4 is always green, and so on.

[16] See section 4.7 for an explanation of how Compendium was used in the comparative analysis process. There is also an explanatory video at http://people.kmi.open.ac.uk/selvin/video/compendiumforresearch/

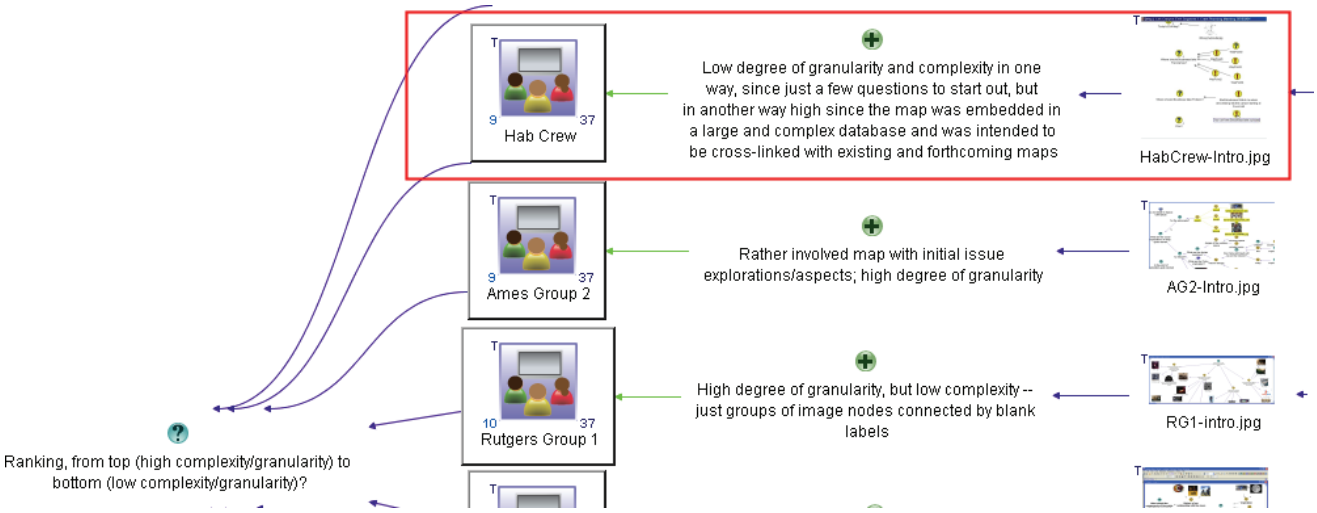



**Figure 6.9: Rationale for ranking of Hab session for Granularity of the pre-created structure**

### 6.1.3.2 Hypertextual refinement

Aesthetic aspects of shaping the hypertext representations was a key focus for the comparative analysis. As described in Chapter 2, practitioner aesthetics are always revealed through their use of a particular medium. For the sessions studied in this thesis, that medium was the Compendium hypertext software tool. Dimension *D.3: hypertextual refinement*, compares the studied sessions in terms of the specifically hypertextual aspects of the aesthetic shaping applied to the representations.

Figure 6.10 shows a portion of the Hab session's main map. Close inspection reveals the two nodes (labeled "Letter Letter / Digit Digit / Digit Digit" and "NOTE ON SAMPLE BAG Naming:") that had been retrieved from earlier project maps as a result of the collaborative sensemaking, navigation, and representational work described in the individual analysis artifacts covered above. The small number "2" in the lower right of the two nodes indicates that those objects each appear in two places in the overall hypertext structure (known as "embedding" or "transcluding" in the hypertext literature).

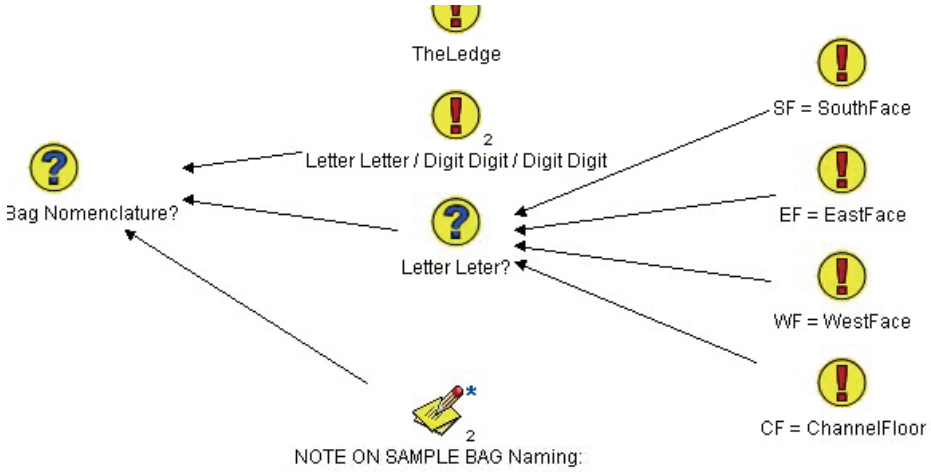



**Figure 6.10: Hypertextual refinement in the Hab session**

Although such embedding reflects a fairly high degree of hypertextual refinement, it was the only example of such refinement in the Hab session. Thus, in the comparative ranking shown in Figure 6.11, the Hab session was assigned only a Medium rating. Some of the higher-ranked sessions for this dimension, such as the RST session, exhibited a higher degree of intentional, careful visual and spatial shaping of the hypertext aspects of the artifact.

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.3. How much attention to hypertextual refinement of shaping | RST<br>High | AG3<br>High | RG2<br>Med<br>High | Hab<br>Med | AG1<br>Med<br>Low | RG1<br>Low | AG4<br>Low | AG2<br>Low |

**Figure 6.11: Hab rating for Hypertextual refinement**

### 6.1.3.3 Overall character of the shaping

Figure 6.12 shows a radar chart summarizing the shaping and framing dimensions for the Hab session (charts for all of the studied sessions are provided in Chapter 8). Granularity of pre-created structure appears at point 1 of the chart, while hypertextual refinement appears at point 19.

Note: The full legend for the chart appears in Figure 6.32 (see Appendix 11.3 for additional details).

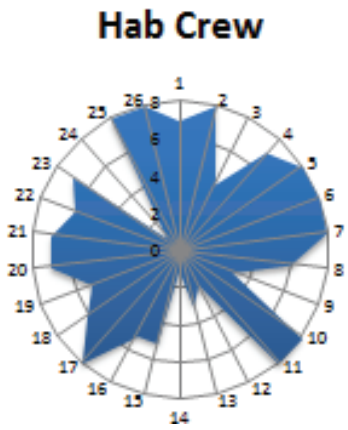



**Figure 6.12: Shaping/framing dimensions for Hab session**

### 6.1.4 Summary

This section has traced in some detail how the analysis artifacts for one of the studied sessions were derived, with reference to a subset of the qualitative dimensions which the following sections now describe. There are five categories of dimensions, which provide a basis to characterize and compare all of the sessions.

## 6.2 Category A: Conducting

The six dimensions analyzed in Category A comprise aspects of a session as a whole, with emphasis on its overall tone or tenor. They paint a picture of the environment that the practitioner functioned in for the period of the session.

Note: The underlined numbers denoting each of the dimensions in the tables below are hyperlinks to Compendium maps with rationale and examples for the placement or ranking of the sessions in that dimension.

Findings from the Conducting dimensions are summarized in Table 6.1.

**Table 6.1: Summary of Category A – Conducting**

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| A.1. How "good"/successful was the session? | Hab | RST | AG4 | RG1 | RG2 | AG1 | AG3 | AG2 |
| A.2. Multiplicity/heterogeneity of focus aspects | RG2 | RG1 | AG3 | AG4 | AG2 | RST | Hab | AG1 |
| A.3. Degree of expressed participant resistance, disagreement, etc. | AG2 | AG1 | AG3 | RG2 | RG1 | Hab | AG4 | RST |
| A.4. Degree of 'noise,' chaos, boisterousness etc. | RG1 | RG2 | AG1 | AG3 | AG2 | RST | AG4 | Hab |
| A.5. Degree of "meta" discussion | RST | AG1 | AG3 | Hab | RG1 | AG4 | AG2 | RG2 |
| | Most map-centric | | | | | | Most discussion-centric | |
| A.6. Where was the session on the spectrum from "discussion-centric" to "map-centric" | RG1 | RG2 | RST | Hab | AG4 | AG3 | AG1 | AG2 |

Sections 6.2.1 through 6.2.6 describe each Conducting dimension in more detail.

### 6.2.1 Conducting dimension A.1: Success of session

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| A.1. How "good"/successful was the session? | Hab<br>High | RST<br>High | AG4<br>High | RG1<br>High | RG2<br>Med<br>High | AG1<br>Med | AG3<br>Med | AG2<br>Low |

There is no objective way to characterize the success of a session, although there has been much research that uses proxies such as participant satisfaction (as expressed in answers to survey questions) or number of ideas generated (e.g. Dennis et al., 1990; Mejias et al., 1996). This thesis does not attempt to provide such a measure. Instead, although the ratings are subjective, a qualitative rationale is provided for each session's ranking, based on emergent criteria through constant comparison within and across the sessions. The ratings here are a combination of factors

such as task/plan attainment, degree of expressed satisfaction both with the overall session and at particular junctures; depth to which the discussion or representation reached; overall coherence, engagement, and usefulness of the representation; new ideas and realizations; and other factors. The most successful sessions had a palpable feeling of productivity and achievement or attainment, energy for the effort, and an overall feeling of engagement (in which both participants and practitioners took the effort seriously (even with lightheartedness as in some cases).

The most successful of the sessions, Hab, had both planned and emergent topics fully covered, a high degree of exchange between all of the parties, an overriding sense of shared purpose and goals, a strong collective focus that rarely wavered, and a high level of satisfaction expressed during and after each subtask as well as regarding the session as a whole. There was a sense of discovery and realization along with a constant forward momentum. Most of all, there was the highest degree of focus of all the observed sessions on the representation itself, on viewing it as a tool for the group's work, a means of communication, and as a repository (a source of past, present, and future shared knowledge.

The RST session was similar in many of these respects, though slightly less focused and integrated, in large part because of its virtual meeting milieu, as opposed to the same time/same place/collocated nature of the Hab session. The session also comprised many activities that were not fully integrated and experienced some setbacks due to data and environment issues. Despite these, though, the session achieved its ambitious process and product goals and created a complex yet compelling, clearly expressed artifact within its highly constrained timeframe. There was a high degree of focus, ownership, validation, contribution, and uptake of participant contributions into the representation (if somewhat more intermittent than that of the Hab session), a similar sense of progress and forward momentum, and of unified contribution (that the representation itself was valued as a contribution that the team was making to the larger effort of which the session was a part).

AG4's session was also highly successful, despite some technical setbacks and a too-much-too-fast issue (see section 7.1), which was handled skillfully. The participants were engaged, and there was a consistent feeling of moving forward during the session; a sense that (despite the artificiality and temporariness that characterized all of the "workshop" sessions) what they were doing mattered, and that the representation was part and parcel of it.

RG1's session, with its well-focused and simple exercise, worked very well, as the participants were able to engage with and understand what they were supposed to do rather quickly, made the right kind of contributions, and kept focus on the representation throughout. RG2's session, in large part due to 'interventionist' facilitation (see section 6.4.2) from both facilitator and mapper (strong moves to direct attention, clarify issues, and focus the discussion) was similar to RG1's. This is not surprising given that both practitioners and participants were all part of the same organization and well known to each other. It was slightly less successful than RG1's session, mainly because of some falling behind and that the practitioners were not able to complete all of their stated agenda within the allotted time.

AG1's session, while mainly hewing to the intended agenda and certainly featuring a fairly high degree of focus on and discussion about the representation, was slightly less successful because when the mapper fell behind, this was less skillfully handled and recovered from than similar issues in RG2 or AG4's session. The resurgence of the "meta" discussion that – while it was focused on the representation – distracted from the overall value by diluting the referential focus and sense of shared purpose and achievement. Indeed, in this case the topic of the "meta" discussion about "critical thinking" vs. "visual thinking" was calling into question whether the session was headed in a coherent direction at all, reflected in this comment from a participant:

> E.: "… why, why is it important… we seem to be getting caught up into but isn't that critical thinking, isn't that critical thinking. Why is that important? I mean, why is it important that we relate all these things to critical thinking."

The practitioners could have made the challenges a central focus in and of themselves and thus turned into something more valuable, or shut them off more firmly, but they weren't able to do either with full effectiveness. AG3's session, while starting off with a good degree of focus, shared attention, and purpose on both the exercise and the representation, lost focus and control towards the end as the attention shifted to the "meta" topic (see section 6.2.5) about software design. This, while it may have been suggested by the content of the exercise, had no direct relation to either carrying out the exercise itself, or to the specific content of the representation.

Finally, AG2's session was the least successful of all the studied sessions. The practitioners were not able to get the participants to focus on the map in the way they intended; similarly, the participants' attempts to engage directly with the map were rebuffed by the mapper, and the momentum intended in the exercise was never recovered. The representation was ignored for most of the session.

### 6.2.2 Conducting dimension A.2: Multiplicity/heterogeneity of focus aspects

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| A.2. Multiplicity/heterogeneity of focus aspects | RG2 | RG1 | AG3 | AG4 | AG2 | RST | Hab | AG1 |

This dimension's rankings were calculated by looking at data from the Grid analyses (see section 4.6.4). A given move could include practitioner focus on (attention to) up to six aspects, in various combinations: participants, maps, text, subject matter, surroundings, and process. Since the focus could be on any or all of these in a given move, there is no inherent primary framework component. The data is incomplete it was performed only on the periods covered in the Sensemaking Moment analyses, and only partially useful in that the RG1 and RG2 sessions did not have screen recordings due to technical problems, possibly reducing the number of moves (and thus inflating the ratio of focus aspects to moves) artificially. The other sessions all had screen recordings that would thus make every practitioner operation on a map register as a separate move.

Nonetheless, the ratios (see Table 6.2) are interesting in and of themselves, when related to the specific character of each sensemaking episode.

**Table 6.2: Ratios of focus aspects to moves**

| Session | Ratio of focus aspects to moves |
|---|---|
| RG2 | **3.35** (87 aspects in 26 moves) |
| RG1 | **3.06** (49 aspects in 16 moves) |
| AG3 | **2.58** (222 aspects in 86 moves) |
| AG4 | **2.14** (77 aspects in 36 moves) |
| AG2 | **2.00** (14 aspects in 7 moves) |
| RST | **1.96** (55 aspects in 28 moves) |
| AG1 | **1.46** (134 aspects in 92 moves) |
| Hab | **1.45** (138 aspects in 95 moves) |

Covering, as they do, a wide range of circumstances, practitioner styles, and different sorts of episodes, the raw data are not that illuminating, at least not as any sort of index. At first glance it might seem that either handling more focus aspects was a higher degree of skill than a lower aspect, but that is belied by the two highest-skill sessions having among the lowest ratios. Conversely, it might be posited that the lower the ratio, the more specifically focused the practitioner is (not spreading their attention too widely and thus diluting it).

In RG2's case, the sensemaking episode concerns a complex set of interactions with the representation and with participants, getting them to validate how a number of items on the map had been captured. As such, many of the moves had a high number of focus aspects, as the facilitator and mapper asked the *participants* (1) to validate changes to the *map* (2) that had to do with *textual* labels (3) that themselves directly captured aspects of the *subject matter* (4). In several cases, such as the example in Figure 6.13, the facilitative verbal moves also had *process* aspects (5). RG1's sensemaking episode had similar characteristics.

| | | | | | Practitioner Focus | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Start** | **End** | **Participant Statement** | **Practitioner Statement** | **Practitioner Action** | **Participants** | **Maps** | **Text** | **Subject matter** | **Surroundings** | **Process** |
| 12:28 | 12:29 | P: I disagree. | | | | | | | | |
| 12:30 | 12:31 | | L: OK. She disagrees. | L. points out that P. does not agree with the current tagging. | x | x | x | x | | x |

**Figure 6.13: Practitioner focus aspects for a move during RG2's sensemaking episode**

At the other end of the spectrum, the lower ratios for the Hab and RST sessions are largely due to the high number of moves consisting of operations on the map. Since "moves" were counted by each unique operation (e.g. a cursor move or editing a label to add textual content would each count as one move), and since the practitioners made a high degree of such moves in quick succession during their rapid operations on the maps, each session has a high degree of moves with one or two focus aspects during their sensemaking episodes. For example, in the sequence from the RST sensemaking episode shown in Figure 6.14, there are four "single aspect" moves made in quick succession as the practitioner undertakes his own hunt for the missing Waypoint information.

| | | | | | | Practitioner Focus | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Start** | **End** | **Participant statement** | **Practitioner action** | **Practitioner statement** | **Compendium move** | **Participants** | **Maps** | **Text** | **Subject matter** | **Surroundings** | **Process** |
| 60:50 | | "I'll look it up" | | | | | | | | | |
| 60:51 | | | S. scrolls down to the "GPS Coordinates" map node | | Display Move | | x | | | | |
| 60:54 | | | S. highlights and opens that map | | Navigate-Map Open | | x | | | | |
| 60:57 | | | S. closes the "GPS Coordinates" map | | Map Close | | x | | | | |
| 60:58 | 60:59 | | S. hits Map Back button, opens that map again | | Navigate-Map Back | | x | | | | |

**Figure 6.14: Practitioner focus aspects for a sequence of moves during RST's sensemaking episode**

Similarly, AG1's session had the lowest ratio of all the studied sessions, because the sensemaking episode contains a large number of single-aspect moves on the map as the mapper, B., tried to keep up with the too-much-too-fast incoming data, then undertook a large number of "delinked" (working largely on her own with little interaction with the participants) moves to repair the map after she admitted she had fallen behind.

### 6.2.3 Conducting dimension A.3: Degree of expressed participant resistance and disagreement

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| A.3. Degree of expressed participant resistance, disagreement, etc. | AG2<br>High | AG1<br>Med | AG3<br>Med | RG2<br>Med | RG1<br>Med<br>Low | Hab<br>Low | AG4<br>Low | RST<br>Low |

Some sessions showed more instances of participants actively voicing or otherwise indicating resistance to or disagreement with some aspect of the proceedings than others. This could take the form of disagreement with the intended or stated purpose of the practitioners' plan; with the course that the session was taking as it progressed; with the way things were being represented on the screen (either as prepared in advance or in progress); or other aspects. In some cases resistance or disagreement was directed at other participants, in some cases at one or more practitioners, in others at text in the representation, and in still others at the shape of the representation. The dimension falls into the *relationship between practitioner and participants* and *context/situation* components of the conceptual framework. This can be an outcome of ethical or aesthetic choices, but not practitioner action in and of itself. Rather it's a measure of what the practitioner may encounter and need to act in response to during a session.

The most successful sessions shared a relatively low degree of participant resistance and disagreement to practitioner actions and intentions. The Hab, RST, and AG4 sessions all had an altruistic flavor, of all in it together. The RG1 session had some minor questioning of the "true" purpose of the exercise, though not of the exercise or course of the session itself, as in the following exchange between participants M. and L., and practitioners D., P., Mi. from 22:54-23:10:

> M.: I feel like I'm trying to guess what's on their mind.
>
> D.: No, …
>
> [Others]: No, this is what…

Mi.: It is actually more interesting if you come up with something entirely different.

L.: Um…

P.: But I can see why they would guess, it kind of …

L.: … it gives us something to think about actually…

RG2's session had one sort segment of participant P.'s disagreement with the way that the second phase of the exercise was unfolding, mostly about the way other participants were attaching tags to a "memory" node that she had earlier contributed, which was swiftly quelled by the mapper (12:26-12:48):

Facilitator: Oh so it is not literature it is philosophy….

P.: I disagree.

Facilitator: OK. She disagrees.

P.: I think it is … I think it is literature and philosophy. Does the owner of the memory get to decide?

Mapper: No, it's gotta be a group thing. But we can, we can change, we can change the tag, but the tag is arts and literature. But you want it to be arts, literature and philosophy?

AG3's session had recurring disagreements about how the somewhat complex intended tagging scheme should play out. The recurring digressions into the "meta" topic also could be seen as resistance through changing the subject; as the chief instigator of this digression, the erstwhile practitioner J., implied, he saw the "meta" topic as more important than the planned exercise. The "meta" topic was in full swing when the session's timekeeper announced that there were two minutes left, followed by J.'s assertion that the "meta" topic was more important (note participant E.'s statement of disagreement as well: (14:32-15:04)

J. (facilitator): That's that's actually so the tags themselves should be subjects and we would put, ideas and we should point to them, those tags. That's a use case for Compendium by the way.

H. (facilitator): Ohh…

J.: In other words there should be no un-subjective, there should be no un-objective representation. Strings should be objects that can be argued about.

[Timekeeper]: "Two minutes more"]

J3. (participant): Or you should at least be able to subjectify anything that is, up until that point is treated as an object.

J. [to timekeeper]: You shouldn't cut us off we're about to re-invent Compendium.

E. (participant): Or not, or not, you can already do that in Compendium.

AG1's session demonstrated a similar pattern as AG3, with resistance and disagreement to the course the session was taking getting more and more attention as the session proceeded (see section 6.2.1). AG2's session had the highest degree of resistance, with several flavors. At the outset of the session, participant J. expressed disagreement with the way the prepared structure had been laid out, and several participants began discussing this:

J2: … so, so you said needs and then you said sexual social and leisure, and I just have this sense that sexual and leisure are, are fairly closely aligned as in related to each other in some sense sub-class super-class, or, they do not belong separate in, in my view…"

A. (facilitator): OK …

J2: …so it is caused a sort of cognitive dissonance looking at your map [gestures at screen] … so I've, I feel like arguing with you about that.

The discussion proceeded on this theme for two more minutes, with several participants expressing their opinions about the map's prepared layout, until the mapper intervened to move the discussion back to the intended course:

> Mapper: I think that all of those are points well taken and can be, you can massage this section up here [highlighting the section of the map the participants had been referring to]… but the section up here is really driving the true point for us which is down here [highlighting a different portion of the map]. What are the implications for NASA and how they design everything else? So yes I agree with all of those points up here [highlighting the section of the map the participants had been referring to] there could be more needs, these things could be grouped underneath one another, stuff like that. Um but where we were going with that was, all of this stuff down here [highlighting the other section], and what are the social dynamics of, say, what are the implications of having just a few people on a spacecraft versus having many.

Although they did not return to the earlier subject, the participants resisted the mapper's intervention and intended direction by not referring to the map at all throughout the remainder of the session.

### 6.2.4 Conducting dimension A.4: Degree of noise

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| A.4. Degree of 'noise,' chaos, boisterousness etc. | RG1<br>High | RG2<br>High | AG1<br>Med | AG3<br>Med | AG2<br>Med<br>Low | RST<br>Low | AG4<br>Low | Hab<br>Low |

This dimension looks at the amount of conversation (and in some cases, chatter) not directed or channeled into the intended discussion, but which has little or nothing to do with a session's purpose. Practitioner skill and intervention can make the difference whether such noise is disruptive or distracting to the session; it can be ignored, tolerated if something else constructive is occurring

(for example, when making repairs to the representation or attending to other matters), or reined in. While none of the studied sessions descended into outright chaos, several (particularly the Rutgers sessions) had high levels of noise at points during the session. The dimension falls into the *relationship between participants and each other* and *context/situation* components of the conceptual framework. This can be an outcome of ethical or aesthetic choices, but not practitioner action in and of itself. Rather it's a measure of what the practitioner may encounter and need to act in response to during a session.

The RG1 and RG2 sessions had the highest degrees of boisterous conversation, in both cases due to the nature of the participants – an 'intact team' in high spirits, apparently enjoying themselves, mostly in the context of the exercise itself. Jokes, side conversations, and multiple conversations going on at once are heard throughout, particularly during RG2's session. In both cases, the practitioners reined in the boisterousness whenever necessary to proceed with the activities. The AG1 and AG3 sessions had lower levels of noise, mostly to do with the arguing that ensued with the "meta" topics. AG2 had a slightly lower level of noise and of a different sort; the conversation was not really boisterous, but not cooperative with the intended direction either. The remaining sessions had little to no noise or boisterousness.

### 6.2.5 Conducting dimension A.5: Degree of "meta" discussion

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| A.5. Degree of "meta" discussion | RST<br>High | AG1<br>High | AG3<br>High | Hab<br>Med<br>Low | RG1<br>Med<br>Low | AG4<br>Med<br>Low | AG2<br>Low | RG2<br>Low |

A chronic pitfall of many meetings, especially with participants having an intellectual bent and not fully focused on a concrete task, "meta" discussion refers to the tendency to "sail above" the ostensible topic with more tangential, abstract, critical, or theoretical observations. However, it is not necessarily a negative thing (unless it takes over the bulk of the meeting and detracts from the

main purpose), and can occur in what are otherwise highly directed sessions. Sometimes “meta” discussions can be highly desirable and in tune with a meeting’s intention and structure, where at other time they are distractions. Such discussions are more problematic when they take the form of comments such as “why are you talking this way” or when an unrelated topic seems to at least some participants to be a better use of time (as were the case for AG1 and AG3 respectively), unless practitioners can find constructive ways of integrating or addressing the concerns. Without that, “meta” discussions have a high potential to derail a meeting. Like the previous two dimensions, this can be an outcome of ethical or aesthetic choices, but not practitioner action in and of itself. Rather it's a measure of what the practitioner may encounter and need to act in response to during a session.

The highly successful RST session featured the highest proportion of “meta” commentary, consisting of observations about how the meeting was progressing and reflections about the process. Since in that case part of the purpose of the session was to help determine how well the tools in use were working for projects like Mobile Agents, and to discover how they could do so better, the “meta” conversations could be said not to be “meta” at all. Indeed, some were captured in the maps themselves (Figure 6.15 shows an example from the end of the session).

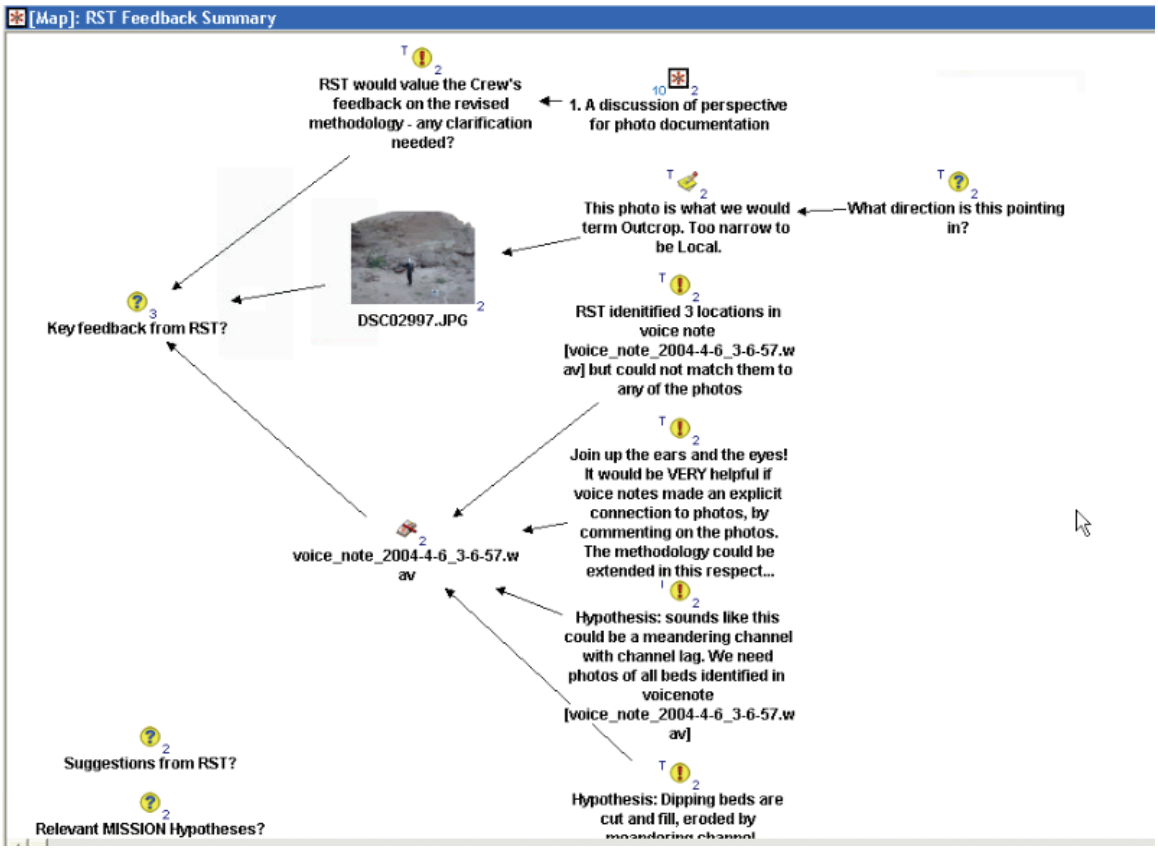



**Figure 6.15: Map from RST session showing "meta" commentary ("Join up the ears and eyes")**

AG1 and AG3's sessions also had high degrees of "meta" discussion which were more distracting than in the RST case. In AG1's case this was the recurring questioning of "why is it important that we relate all these things to critical thinking," while in AG3's case it was the ideas and discussion about Compendium's software design. Most of the other sessions had lower levels of "meta" discussion. There were a few such comments in the Hab session, mostly about process choices. The RG1 session had some slightly "meta" comments about what constituted the right kind of answers and about practitioner intentions and participant understanding of them. AG4's session, too, had some humorous reflections on the way the session was going. AG2 and RG2 had no real such discussion.

### 6.2.6 Conducting dimension A.6: Spectrum of "map-centric" to "discussion-centric"

| | High = Most map-centric | | | | | | Low = Most discussion-centric | |
|---|---|---|---|---|---|---|---|---|
| A.6. Where was the session on the spectrum from "discussion-centric" to "map-centric" | RG1<br>High | RG2<br>High | RST<br>High | Hab<br>High | AG4<br>Med<br>High | AG3<br>Med | AG1<br>Med<br>Low | AG2<br>Low |

In some of the studied sessions, nearly all of the attention, whether visual or verbal, was focused on the maps themselves ("map-centric" sessions). In these sessions, the discourse in general was shaped and structured around the maps. Other sessions had more of the tone of an open discussion that did or (in some cases did not) touch on the maps ("discussion-centric" sessions).

The dimension falls into the *relationship between practitioner and participants, relationship between participants and each other,* and *context/situation* components of the conceptual framework. The degree of "map-centric" vs. "discussion-centric" interaction can be a function of any or all of these.

The RG1, RG2, RST, and Hab sessions were the most "map-centric"; nearly all the interaction was about the maps themselves, though some had some "discussion-centric" periods as well. By contrast, AG3's session started as "map-centric" but then veered off into discussion (and stayed there). AG1's session had a lot of discussion that was not integrated with the maps. AG2's session was nearly all "discussion-centric" after the early, rebuffed "map-centric" engagement (see section 6.2.3).

## 6.3 Category B: Planning

The six dimensions analyzed in Category B comprise aspects having to do with how practitioners planned their sessions to proceed in advance, and other pre-session factors such as characteristics of practitioners' chosen method and approach. Pre-session planning and artifacts vary in dimensions like ambitiousness and structural granularity. This category includes analyses of how closely the actual playing out of the session aligned with the intended plans, including dimensions such as

divergence from intended plan (emergent direction), and practitioner and participant adherence to the intended plan. Three of the dimensions (B.1, B.3, and B.4) concern *advance* aspects, meaning aspects that take place temporally before the start of the session (or could characterize how the session "looked" at its outset). The other three (B.2, B.5 and B.6) concern *as-played-out* aspects of planning, looking at how closely the actual session conformed to the advance expectations. Findings from the Category B dimensions are summarized in Table 6.3.

**Table 6.3: Summary of Category B – Planning**

| | IBIS/issue mapping | | | New/unique/hybrid methods | | | | |
|---|---|---|---|---|---|---|---|---|
| B.1. Choice of method | AG1 | AG2 | AG4 | AG3 | RG1 | RG2 | RST | Hab |
| | Takes pre-determined course | | | Combination of pre-determined and emergent | | | | Emergent |
| B.2. How much of the shaping and process is "emergent" vs. pre-determined | AG4 | RG1 | RG2 | RST | AG1 | AG3 | Hab | AG2 |
| | High | | | | | | | Low |
| B.3. Granularity of the pre-created structure (degree and complexity) | RST | Hab | AG2 | RG1 | AG4 | AG3 | AG1 | RG2 |
| B.4. Ambitiousness of the planned approach | Hab | RST | AG3 | RG2 | AG1 | RG1 | AG2 | AG4 |
| B.5. Degree of practitioner adherence to the intended method during the session | AG4 | RG1 | RG2 | RST | Hab | AG1 | AG3 | AG2 |
| B.6. Participant adherence/faithfulness to the intended plan | AG4 | Hab | RST | RG2 | RG1 | AG1 | AG3 | AG2 |

The *advance* Planning dimensions (B.2, B.5, and B.6) comprise facets of the kinds of expectations practitioners had for the nexus of tool set up, representation set up and what they expected would come from or could be generated by the participants. Each group put different weight on different aspects, for different reasons. These dimensions can be characterized in terms of the experiential components discussed in Chapter 2. Each of the sessions had greater or lesser shaping of the form (*aesthetics*) of the advance artifacts, into which they had various expectations of what the participants would have to do and the way they intended participants to act and communicate (*ethics*). Each constructed (or already inhabited in the case of the Mobile Agents sessions) a

*narrative* structure that gave varying degrees of implicit or explicit meanings into which both the pre-created artifacts and intended activities would be placed. Each of the practitioners expected their sessions to proceed as planned, not explicitly including contingencies for practitioner *sensemaking* or *improvisation*, though some did expect or assume that the participants would have to make sense of the pre-created artifacts and that an emergent (or improvised) discussion would ensue.

The other three *as-played-out* Planning dimensions have to do with the way the intended *advance* dimensions occurred during the actual session. There are three ways to compare intention vs. actuality. One looks at how much the session in general followed the intended course. Three of the sessions followed the course the practitioners intended, but in different ways. AG4's session unfolded exactly as planned despite several technical challenges and the relative inexperience of the mapper, largely due to skillful facilitation (there was nothing especially compelling about the planned exercise, and its pre-created structure was simple). RG1 and RG2 had carefully planned and highly structured exercises with defined beginning, middles, and ends, self-contained in the sense that the exercises' start and end points were meant to occur within the boundaries of the short session, as opposed to the ongoing, no clear end point plans from the more "discussion" or "emergent"-oriented sessions such as AG2. All three (AG4, RG1, and RG2) required a good deal of facilitative intervention to stay on track.

In contrast, most of the other groups had *as-played-out* combinations of following the pre-determined course and unexpected directions that (to a greater or lesser degree) took over the proceedings. Some of the emergent directions were compelling (of intrinsic value), while others were more in the character of distractions. The emergent directions could either be in *harmony* with the intended direction (as in the case of the RST and Hab sessions) or in *dissonance* with it (as in the case of AG3 and AG2). For example, the RST session had a packed pre-planned agenda, all of which was accomplished within the session, but there were also several unplanned, emergent episodes

(such as figuring out how to deal with the missing science data, or discussions of the dynamics between the RST and other teams). Both AG1 and AG2 had various kinds of dissonant emergent memes, both "meta" in character – some participants started to critique other participants' contributions, or to follow tangents that diverged from the intended containers (see section 6.2.5).

Sections 6.3.1 through 6.3.6 illustrate each dimension in more detail.

### 6.3.1 Planning dimension B.1: Choice of method

| | IBIS/issue mapping | | | New/unique/hybrid methods | | | | |
|---|---|---|---|---|---|---|---|---|
| B.1. Choice of method | AG1 | AG2 | AG4 | AG3 | RG1 | RG2 | RST | Hab |

Choice of method, an *advance* dimension, concerns the types of method that the practitioners planned to use in the studied sessions. In addition to the *methods* framework component, A.1 falls into the *aesthetics* and *narrative* components since choice of method has to do with the giving of narrative form to a session, the framing of what is expected to happen, and the has much to do with both advance shaping of visual/textual/hypertextual artifacts as well as determining what kind of shaping will be performed during the session.

The results cluster into two categories. Three of the sessions (AG1, AG2, and AG4) planned to use an IBIS or issue-mapping approach, intending the session to proceed in classic "argumentation" style (issues or questions, positions or answers, pros and cons to positions). The other five sessions planned to employ either a combination of methods, such as the RST's session's combination of hypotheses, observations, and comments in the form of nodes linked to the various materials, tagged with one of a set of pre-formulated tags, with the intention of linking key items back to a summary map); or developed a new method on the spot in an ad hoc manner, such as RG2's evoking and relating/grouping memories from images of the space program.

### 6.3.2 Planning dimension B.2: How much of the shaping and process is "emergent" vs. pre-determined

| | Takes pre-determined course | | | Combination of pre-determined and emergent | | | | Emergent |
|---|---|---|---|---|---|---|---|---|
| B.2. How much of the shaping and process is "emergent" vs. pre-determined | AG4 | RG1 | RG2 | RST | AG1 | AG3 | Hab | AG2 |

The “emergent” vs. pre-determined distinction is an *as-played-out* dimension, which concerns how closely the actual session matched the planned direction. It falls into the *context/situation* component of the conceptual framework since it is primarily an aspect of the session itself, not of practitioner action. It also pertains to the participants and their relationships with the practitioner, representation, and each other, and to *ethics* because it is (to varying degree) a function of practitioner action or inaction that allows or determines this.

During the sessions, shaping and process sometimes followed the pre-determined course, and sometimes took an emergent, unplanned direction. The dimension and the assignment of sessions to the three result categories do not represent a judgment on the quality of the direction a session took; rather, it is a simple characterization. The results cluster into three categories. Sessions AG4, RG1, and RG2 followed the course that the practitioners intended. AG4’s session followed the intended course throughout, while RG1 and RG2 did so with some “bumps in the road” necessitating course corrections on the part of the practitioners. At the other end of the scale, AG2’s session was almost completely “emergent” in the sense that it departed almost immediately from the planned course of events and did not return to that course despite several practitioner attempts to do so. The other four sessions (RST, AG1, AG3, and Hab) represented a combination of pre-determined and emergent directions as they played out. For example, AG1’s session mostly followed the pre-determined course, but also partially got 'derailed' due to the unplanned 'visual vs. critical thinking'

issue. Similarly, the Hab session mostly followed the intended agenda, but a new topic came up towards the end that spawned (at least for a while) a new shaping/process.

### 6.3.3 Planning dimension B.3: Granularity of the pre-created structure

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| B.3. Granularity of the pre-created structure (degree and complexity) | RST<br>High | Hab<br>High | AG2<br>Med<br>High | RG1<br>Med<br>High | AG4<br>Med | AG3<br>Med | AG1<br>Low | RG2<br>Low |

Granularity of the pre-created structure is an *advance* dimension, which ranks the sessions from High to Low. It concerns the representation itself, falling into the *aesthetics* (because it has to do with the shaping given to the pre-created structure) and *narrative* (because it is about the expected (canonical) interaction and meaning given to the representation in advance) components of the conceptual framework.

Several of the sessions created maps beforehand with a high degree of granularity. These maps contained many nodes, links, and whole sets of interconnected maps in the case of the Hab and RST sessions, whose pre-created structures also included artifacts from many previous sessions and reference data from other sources. Of the 'workshop' sessions, in one case (AG2), the practitioners had built out a complex and highly granular issue map of their planned subject ("sex in space"). RG1's structure was less granular that that of RST, Hab, or AG2, but still had a good deal of structure set up for their intended exercise – a web of links and associations between their selected images that they intended the participants to fill in. The remaining four sessions mostly created variations on "seed' concepts or images that they intended to build more structure from during the sessions.

Figure 6.16 and Figure 6.17 illustrate the contrast between the lowest degree of pre-created granularity (RG2) and the highest (RST). RG2's pre-created map contains only three image nodes on one map, with no links), whereas one of the several RST pre-created maps contains extensive

structuring and arrangement, representing the carefully planned set of artifacts to be used during the session.


**Figure 6.16: RG2's pre-created map**

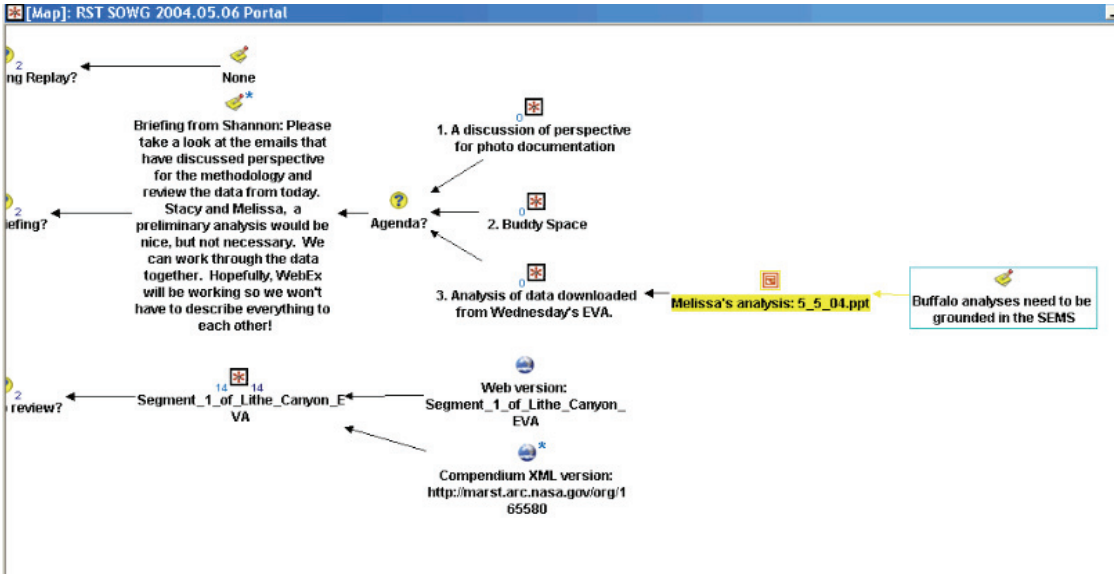



**Figure 6.17: One of the pre-created RST maps**

### 6.3.4 Planning dimension B.4: Ambitiousness of the planned approach

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| B.4. Ambitiousness of the planned approach | Hab<br><br>High | RST<br><br>High | AG3<br>Med<br>High | RG2<br>Med<br>High | AG1<br><br>Med | RG1<br>Med<br>Low | AG2<br>Med<br>Low | AG4<br>Med<br>Low |

Ambitiousness of the planned approach is an *advance* dimension, ranking the sessions from High to Low according to the level of ambitiousness that the practitioners had for the approach they planned to take in the session. The level of ambitiousness was partially, but not completely, correlated with the level of granularity discussed in section 6.3.3. It primarily concerns the chosen *methods*, but also *aesthetics* (since there are shaping decisions about the scope and scale of the planned approach (how 'ambitious' is the form); *ethics* (in that it has to do with how much and what kind of interaction and expectations there will be of the participants, and *narrative* (in the expected sequence and shape of events and how they are expected to play out in terms of the approach) components of the conceptual framework.

The two most ambitious plans, Hab and RST, also had the highest level of granularity, in keeping with their characteristics of highly engaged, process-driven analysis and planning sessions that were themselves part of long-term projects. Each of their practitioners had significant direct interest in seeing how useful the representations and software could be for their purposes. The lower-ranked sessions had less correlation between ambitiousness and granularity. AG3 had an ambitious and somewhat complex plan for their session (which resulted in some problems during the session itself), but their pre-created structure was relatively low in visible granularity (though there were "hidden" links). RG2's ambitious memory exercise contained several intended phases (only two of which were actually carried out), but had a very simple pre-created structure (see Figure 6.16). AG1 had a lower level of ambitiousness. The practitioners planned a straightforward discussion capture, seeding the map with a few questions and answers, though they also intended to include image-choosing and tagging activities that were not carried out in the actual session. RG1's planned

approach, though their pre-created map had a higher degree of granularity, had a less ambitious planned approach. The practitioners intended the participants to name the pre-created groups of images, and then compare the labels, followed by an unveiling of the names the practitioners themselves had chosen. AG2, though they had a highly granular pre-created map and ambitious goals for their session (they hoped for a highly generative discussion of the topics), had a relatively simple approach (they expected the discussion would unfold naturally from the pre-created maps. AG4's chosen approach was a straightforward dialogue mapping exercise, relatively low in ambition.

The above represent a spectrum of kinds of practitioner ambition for their sessions. Some had high degrees of what they expected from the participants (e.g., AG3's expectation that participants would be able to understand and carry out their complex tagging exercise), while others (such as AG2) presented complex subject matter that they expected the participants to be able to assimilate. In others, such as the expert sessions (Hab and RST), the ambitiousness was in the depth and breadth of the tasks they expected to be able to complete within the limited time available for their sessions.

### 6.3.5 Planning dimension B.5: Degree of practitioner adherence to the intended method during the session

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| B.5. Degree of practitioner adherence to the intended method during the session | AG4 High | RG1 High | RG2 High | RST High | Hab High | AG1 Med | AG3 Med | AG2 Low |

Degree of practitioner adherence to intended method is an *as-played-out* dimension, ranking the sessions from High to Low according to how closely the practitioners kept to the method(s) they had planned to use in the session. It primarily concerns the methods component of the conceptual framework, but also falls into the *ethics* (in the choice-making of whether it is better (or not) to stick with the intended method) and *narrative* (in the playing out of either staying within the intended frame or not).

Sessions at the High end of the scale, such as AG4 and RG1, kept to the intended method throughout, while sessions at the lower end saw practitioners depart from or abandon their planned approach when trouble struck, possibly due to lack of experience in how to handle such situations. Highest-ranked AG4 performed a variety of facilitative moves (clarifying and restating participant contributions, "time-shifting" (returning to a previously stated but not captured contribution), and others) that kept the discussion within the bounds of the intended process and directed at the representation. RG1 and RG2 stuck to their planned exercises and carried them through despite a fair amount of boisterousness or some initial confusion.

At the low end of the scale, AG3's practitioners stuck to their planned method for most of the session but did not know what to do when the discussion swerved off-topic. AG2's practitioners were not able to get the participants to follow the intended method and appeared to give up trying to do so after some failed attempts. The practitioners in the three lowest-ranked sessions were not able to contain divergences from participants, and thus either gave up (AG3, AG2) or got so far behind as to need help to get back on track (AG1).

### 6.3.6 Planning dimension B.6: Participant adherence/faithfulness to the intended plan

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| B.6. Participant adherence/faithfulness to the intended plan | AG4<br><br>High | Hab<br><br>High | RST<br><br>High | RG2<br>Med<br>High | RG1<br>Med<br>High | AG1<br><br>Med | AG3<br>Med<br>Low | AG2<br><br>Low |

Degree of participant adherence to intended method is an *as-played-out* dimension, ranking the sessions from High to Low according to how closely the participants kept to the method(s) the practitioners had planned to use in the session. This dimension's rankings were closely, though not completely, correlated with those of A.5 (practitioner adherence). It is primarily an aspect of the participant experience of session itself rather than a characterization of practitioner action, and thus primarily falls into the *participants* and *context/situation* components of the conceptual framework.

It also concerns the relationships between participants and the practitioner as well as the representation, and *ethics* because it is (to varying degree) a function of practitioner action or inaction that allows or determines this.

Due in large part to skillful facilitation, AG4's participants stayed completely within the intended plan. The Hab and RST participants were highly motivated do stay within the mandates of the given agenda and methods, largely due to their strong project role identification and personal interest in the subject matter, process, and meeting outcomes. Participants in both Rutgers sessions (RG1, RG2) showed a higher propensity to diverge, whether due to boisterousness, joking around, or confusion, but were also willing (with the encouragement and sometimes strong guidance of the facilitators) to be brought back on track. On the other end of the scale, three of the Ames sessions (AG1, AG2, AG3) all had participants bringing up "extrinsic" themes that at times took over the proceedings, whether tangential topics or stated objections to the way the session was going.

## 6.4 Category C: Relating

The nine dimensions analyzed in Category C comprise aspects that characterize the ways practitioners interacted with participants during the sessions. The dimension cluster into three groups: *regulating,* the ways practitioners govern the flow of discourse, especially verbally; *bringing to the representation,* which refers to practitioner interventions to get participants to engage with the visual representation; and *collaboration*, which refers to the degree of cooperation between various parties in the session.

*Regulating:* This subcategory comprises dimensions C.1, C. 2, C. 3, C.4, and C.6, examining the means by which practitioners governed the flow of conversation, activities, and discourse during the sessions, especially verbally. It looks at behaviors used to bring the conversation to a desired state or to direct activities in some way.

*Bringing to the representation*: This subcategory comprises dimensions C.5 and C.7. Both have to do with direct interventions of getting the participants to look at and interact with the representation, and be key indicators of practitioner effort toward participant engagement with representations.

*Collaboration:* This subcategory comprises dimensions C.8 and C.9. Both look at varieties of direct collaboration during the sessions. C.8 is only applicable for the sessions with more than one practitioner, and examines collaboration between multiple practitioners, while C.9 looks at the degree of collaboration or co-construction between practitioners and participants. Each considers what form the collaboration took (its *style*, *force*, and *purpose*) as well as how the collaboration played into the overall dynamics of the sessions.

Findings from the Relating dimensions are summarized in Table 6.4.

**Table 6.4: Summary of Category C – Relating**

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.1. Density of practitioner verbal moves (frequent vs. infrequent) | Hab | RG2 | AG4 | RG1 | AG3 | AG1 | RST | AG2 |
| C.2. Practitioner willingness to intervene – frequency and depth of intervention | Hab | RG2 | AG4 | RST | RG1 | AG1 | AG3 | AG2 |
| | High practitioner drive | | | Mixed practitioner and participant drive | | | High participant drive | |
| C.3. High practitioner "drive" of the session vs. high participant "drive" | RG2 | RG1 | AG4 | AG3 | Hab | RST | AG1 | AG2 |
| | High | | | | | | | Low |
| C.4. Degree of practitioner-asked clarifying questions to participant input | Hab | AG4 | AG3 | RST | RG2 | AG1 | RG1 | AG2 |
| C.5. Degree which practitioners requested validation of changes to representation | AG3 | AG4 | Hab | RST | RG2 | AG1 | RG1 | AG2 |
| C.6. Degree of practitioner "gating" of participant input | RG2 | AG3 | AG2 | AG1 | AG4 | Hab | RG1 | RST |
| C.7. Degree of intervention to get participants to look at the representation | Hab | RST | RG2 | AG4 | RG1 | AG3 | AG1 | AG2 |
| C.8. Degree of collaboration between multiple practitioners (where applicable) | RG2 | AG4 | AG3 | RG1 | AG1 | AG2 | | |
| C.9. Degree of collaboration/co-construction between practitioners and participants | Hab | RST | AG1 | AG4 | RG2 | RG1 | AG3 | AG2 |

Sections 6.4.1 through 6.4.9 explain each Relating dimension in more detail.

### 6.4.1 Relating dimension C.1: Density of practitioner verbal moves

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.1. Density of practitioner verbal moves (frequent vs. infrequent) | Hab<br>High | RG2<br>High | AG4<br>High | RG1<br>High | AG3<br>High | AG1<br>Med<br>High | RST<br>Med<br>High | AG2<br>Low |

Density of practitioner verbal moves is a *regulating* dimension. It assesses how often practitioners spoke to participants during their sessions. The ratings here match those for dimension C.8 almost identically except for the RST session (fourth in the 'practitioner willingness to intervene' dimension, but seventh here), since there were very long segments where the practitioner was engaged in "de-linked" work or silent mapping while the participants spoke. It falls into the *relationship between practitioner and participants* and *ethics* components of the conceptual framework as it concerns practitioner decisions to verbally intervene with participant conversation and actions.

The Hab, RG2, AG4, and RG1 practitioners all made frequent verbal moves throughout their sessions. AG3's facilitator and mapper made frequent verbal moves until the last few minutes of the session, when they dropped off in the face of the "meta" discussion (which was in fact fuelled by the other ostensible practitioner stepping out of his facilitative role and engaging in the discussion as a participant; see section 6.2.5). AG2 had a low density of verbal moves in general, although the facilitator took up a large amount of the session with her few moves, mostly long descriptions and monologues about the subject matter.

### 6.4.2 Relating dimension C.2: Practitioner willingness to intervene

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.2. Practitioner willingness to intervene – frequency and depth of intervention | Hab<br>High | RG2<br>High | AG4<br>High | RST<br>High | RG1<br>High | AG1<br>Med | AG3<br>Med<br>Low | AG2<br>Low |

Practitioner willingness to intervene is a *regulating* dimension, referring to the frequency and depth of practitioner interventions in general (as opposed to specific kinds of intervention discussed in other Relating dimensions). It falls into the *relationship between practitioner and participants* and *ethics* components of the conceptual framework as it concerns practitioner decisions to intervene with participant conversation and actions.

Most of the sessions (Hab, RST, AG4, RST, and RG1) exhibited a high degree of practitioner willingness to intervene at different levels throughout the session. The practitioners varied in the forcefulness of their interventions, as a function of both events in the session as well as the personal style of the practitioners, and in general intervened without showing reluctance, getting silenced, or overwhelmed. All of these sessions also exhibited high degrees of practitioner "drive" (see section 6.4.3).

The remaining sessions (AG1, AG3, and AG2) did not exhibit significant amounts of directing participants to look at the representation. For example, in AG1's session, there was little true intervention from the facilitator except for a few comments about time and process. Most of the "interventions" in the session came from participants rather than the facilitators. AG3's practitioners started out willing to intervene, but lost steam as the session went on and the "meta" issues took center stage (see section 6.2.5). In AG2's session, there was only one such instance, early on where the mapper requested participants to focus their comments in a different part of the representation than they had been commenting on. This was actually one of the most forceful of the interventions in all of the observed sessions, but the only such instance in the session.

Note: Sustaining the willingness to intervene over time may be a key differentiating factor between novice/less-skilled and expert/skilled practitioners. Most practitioners even of different skill levels will start out willing to intervene, but many of lower skill levels appear to give up in the face of entropy, divergence, or other "messy" factors, or after trying to intervene without success. There may even be a chartable correlation here: as the degree of noise, divergence, and "mess" increases over time in a session, willingness to intervene decreases as a function of skill and experience.

### 6.4.3 Relating dimension C.3: Practitioner vs. participant "drive"

| | High practitioner drive | | | Mixed practitioner and participant drive | | | High participant drive | |
|---|---|---|---|---|---|---|---|---|
| C.3. High practitioner "drive" of the session vs. high participant "drive" | RG2 | RG1 | AG4 | AG3 | Hab | RST | AG1 | AG2 |

Practitioner vs. participant "drive" is a *regulating* dimension, referring to whether it was primarily the practitioners who propelled the direction of the session, or whether the propulsion came from both practitioners and participants, or whether it was primarily driven by the participants. It is just as concerned with the *ethics* aspects of practitioner interventions and with participants as the previous two dimensions, but it also has to do with *narrative* since it concerns how much the practitioner works to make the session conform to their narrative framing (whether pre-planned or emergent).

The two Rutgers sessions, RG1 and RG2, despite the participants' propensity to joke around, were very much driven by the practitioners, who gave each session a clear structure and stuck to it throughout, bringing the participants along their planned trajectory. Similarly, the skilled facilitator of AG4, while keeping the tone of an open discussion, very much drove the participants along the intended course.

In contrast, AG3's session was a mixture of participant and practitioner drive, mainly because of the recurring side topics brought up by participants that, though quelled several times, ultimately the

practitioners weren't able to rein in. Similarly, the practitioners in the Hab and RST sessions encouraged the participants to drive the session, though in different ways. The Hab practitioner actively and consistently asked the participants to take the session's reins, while in the RST's case one of the participants was a strong presence who assumed control over the analysis work. In both cases, however, the practitioners did decide when to move on to new agenda items, played central roles in discussion and problem-solving, and determining the course of the sessions as they proceeded.

Both AG1 and AG2 sessions experienced high participant drive. In AG1's case, this was due to the force with which the participants took control of the discussion itself, to the point where the mapper got behind and couldn't contain the different threads and topics in her maps. For AG2, although the mapper did make one forceful attempt to drive the session in the direction he wanted, the participants largely ignored it.

Note: Although at first glance this dimension might seem similar to Planning dimension A.5: degree of practitioner adherence to the intended method during the session, in fact they differ. A practitioner might drive a session in a completely different way than was intended in the planning phase.

### 6.4.4 Relating dimension C.4: Practitioner use of clarifying questions

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.4. Degree of practitioner-asked clarifying questions to participant input | Hab<br><br>High | AG4<br>Med<br>High | AG3<br>Med<br>High | RST<br>Med<br>High | RG2<br><br>Med | AG1<br><br>Med | RG1<br>Med<br>Low | AG2<br>Med<br>Low |

Practitioner use of clarifying questions is a *regulating* dimension, referring to the degree to which practitioners asked participants for explanations of their contributions in order to understand and incorporate it correctly. It falls into the *ethics* component because it involves practitioner moves to make sure they understood a participant and acknowledging (to some degree) the validity of the

participant's input. It also concerns *sensemaking* since it involves the 'fit' between the new input and the intended purpose or plan; and *narrative* since it has to do with trying to make the input conform to the understood frame of reference.

As noted in section 6.4.3, AG4's facilitator, D., asked clarifying questions frequently, not only to be sure she understood the contributions but also as a strategy to slow down the speed of participant input so that the mapper could catch up. D. sometimes asked an extended series of such questions in order to figure out how an apparent non seqitur could be successfully integrated into the representation, as in this excerpt when participant J. made the one-word contribution "Money." In this case L., the mapper, asked clarifying questions as wel. Practitioner clarifying questions are bolded:

J.: Money.

H.: Free tours.

**L.: Money?**

J.: Mm.

**D.: So money? Whadda ya mean by money. Can you say a little bit more about that?**

J.: Um, yeah, I would, uh, I would I would like to, to be a participant and be funded in the project.

**D.: Yeah, to, to, to go to the moon? Is that what you're saying?**

J.: That would be too.

**D.: Uh what, I'm trying to get at what you meant, you want to be funded in, in participating in…?**

J.: I was making actually a much larger statement and that is the thing that inspires most everybody is some, some access to funding to do whatever it is they want to do in relation to the project.

**L.: As a tax, as a general taxpayer um would you want all taxpayers to be funded or?**

J.: Oh I wasn't thinking about in terms of them.

L.: OK you're answering the question that we actually asked … uh huh.

**D.: OK so in terms of what would actually inspire you, an individual of this group, um, one of the answers was um financial benefit? [touching projection screen] personal financial benefit from the program?**

J.: Yeah if you would turn "money" into a map you'd find that inside of it is greed.

The Hab's highly collegial session had the highest level of clarifying questions, with the practitioner continually asking such questions in a highly interactive manner, sometimes combining references to a node's wording, the subject matter (e.g. geology), particulars of the project, and process aspects (in what could be termed highly *referential* or *embedded* clarifications). AG3's mapper asked many clarifying questions trying to understand how participant contributions could be shaped into, and count as, the kind of connecting concepts the AG3 exercise called for. RST's practitioner asked a fair number of clarifying questions to make sure he understood the input well enough to incorporate it into the maps, or that he had heard correctly (the session was held over a phone teleconference). RG2's practitioners also asked clarifying questions, particularly in the second phase when they were doing the rather complex act of eliciting tag and group names for the elicited memories, making sure they were capturing the intended tags accurately. This also served to help clarify how they themselves would perform the shaping since it turned out not to be as straightforward as it has seemed in the planning session.

On the lower end, AG1's practitioners asked fewer clarifying questions. The ones they did ask were more of the "what did you say?" variety. Similarly, RG1's mapper/facilitator only asked "what did you say" rather than "is this what you meant" types of questions. AG2's facilitator and mapper did not ask clarifying questions, though the facilitator tried to enter into the discussion several times. However, this was more in the tone of a discussant (contributing to the subject matter) than a clarifier.

### 6.4.5 Relating dimension C.5: Practitioner-requested validation of changes to representation

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.5. Degree which practitioners requested validation of changes to representation | AG3 High | AG4 High | Hab High | RST High | RG2 Med | AG1 Med | RG1 Med | AG2 Low |

This dimension, a more specific case of dimension C.7 (practitioner intervention to get participants to look at representation), is a *bringing to the representation* dimension referring to the degree to which practitioners asked participants to review and approve changes that the practitioner(s) had made. As such it is primarily a dimension of practitioner *ethics* since it a key aspect of practitioner choice to ensure that participants are "bought in" to the representation and engaged with it. It also involves the *aesthetics* component since it concerns changes to the representation itself (shaping), as well as *sensemaking* since it involves the 'fit' between new input and the purpose or plan, and *narrative* since it has to do with conforming the input to the understood frame of reference.

The AG3, AG4, Hab, and RST practitioners all exhibited a high degree of this, frequently asking the participants to validate their changes. Sometimes this took the form of simple verbal queries (e.g. "Is that right?") while other times there were more elaborate or drawn out invitations to examine a whole section or series of recent actions. AG1, RG1, and RG2 had a lower degree (even though RG2 had a high degree of attention-bringing in general, they did not explicitly request validation of

changes as many times as the higher-ranking sessions). AG2's practitioners did not make any validation requests during their session.

Note: The *grainsize* – the size or area of the material that practitioners ask participants to validate – is an area for future refinement of this dimension. For example, sometimes the grainsize was as small as a single word in a label, while at others it could be a large portion of a map or indeed several maps.

### 6.4.6 Relating dimension C.6: Practitioner gating of participant input

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.6. Degree of practitioner "gating" of participant input | RG2<br>Med<br>High | AG3<br><br>Med | AG2<br><br>Med | AG1<br><br>Med | AG4<br><br>Low | Hab<br><br>Low | RG1<br><br>Low | RST<br><br>Low |

Practitioner gating of participant input is a *regulating* dimension, referring to the degree to which practitioners made verbal moves that explicitly determined which participant contributions or statements would "count" toward the session's accepted discourse (or be included in the representation). Gating occurs when a practitioner blocks or sets aside participant contributions or suggestions. It falls mainly into the *ethics* component of the conceptual framework; every gating is an ethical choice (to include something or not).

The highest degree of gating came from RG2, whose practitioners tightly controlled which types of statements would count as "memories" or grouping moves, even at one point making an on-the-fly determination that a participant's grouping countermove wouldn't be allowed. They were firm in stating which types of statements met the criteria and made active statements about what they would and wouldn't allow. AG3, at least in the main body of the session, also saw a large degree of practitioner determination of what would count as a proper tag to give the connections and what the tags were meant to mean, in a fast-paced give-and-take with the participants and each other. They did not allow or map the "meta"-questions that kept arising (see section 6.2.5). AG2's mapper

made a forceful gating move early in the session (though none thereafter) that was probably the most dramatic instance of gating observed in any of the sessions – a verbal and visual intervention instructing the participants not to talk about the area of the map they had tried to, and to instead direct their attention elsewhere in the map. In AG1's case, some gating occurred when the mapper decided to set aside a participant's suggested approach in favor of a previous pattern she had established.

AG4's session had a lesser degree of such gating. When the facilitator was confronted with a contribution that she couldn't immediately see how to include in the representation, she would ask clarifying questions until she was able to see how it fit in. The Hab practitioner did little gating except at the very end of the session, where he cut off one of the participants' attempt to add more explanation by saying that the other teams could read the source material for themselves. Neither RG1 nor RST's practitioners did any explicit gating during their sessions.

### 6.4.7 Relating dimension C.7: Practitioner intervention to get participants to look at representation

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.7. Degree of intervention to get participants to look at the representation | Hab<br>High | RST<br>High | RG2<br>High | AG4<br>High | RG1<br>Med | AG3<br>Med | AG1<br>Med | AG2<br>Med<br>Low |

Practitioner intervention to get participants to look at the representation is a *bringing to the representation* dimension, referring to the degree to which practitioners actively (through verbal or physical (such as pointing) means) directed participants to look at and consider the visual representation on the screen. All of the studied practitioners did this to some degree, with varying *styles* (what physical and verbal means they used to do this), *purposes* (why and when in the session they chose to do this), and *force* (how firmly they pushed their participants to do this, ranging from token gestures to stronger, "you must look at this" moves). It falls primarily into the *ethics* component of the conceptual framework. Every such intervention is an ethical choice, where

practitioners choose to direct participant attention away from whatever else they might be paying attention to, and toward the object of the practitioner's choosing.

Both the Hab and RST practitioners intervened for this frequently and in depth throughout their sessions, both through *verbal* (asking or telling the participants to look at something on the maps) and *software* means (for example by gesturing with the mouse pointer or selecting and highlighting items on the screen), in similar ways. The RST's was a virtual session and there was no *physical* way for the practitioner to gesture or direct attention. Similarly, even though the Hab's was a face-to-face session, the practitioner remained seated behind his laptop and did not employ physical means of directing participant attention. Neither had to use much *force* since the representation was (in different ways, but similar degree) *integral* to the proceedings; rather there was a naturalness or seamlessness to the manner in which the practitioner directed attention to the representation. The following examples from the Hab session show two instances (at 25:10–25:13 and at 28:40- 29:27) where the practitioner, M., had the participants (A. and B.) look at the screen to comment on or validate how he had captured items on the map, without needing to explicitly state that they should do so. The first example is a request for direction for where to place a node, while the second is both a similar request and a request for validation of the changes (see Relating dimension C.11: Practitioner-requested validation of changes to representation):

25:05:00 M. moves the cursor around the set of nodes.

25:10:00 M.: "y'know so you want me to put Waypoint 0 there?"

25:11:00 A: "As a question mark? Sure" [referring to a Compendium node type]

25:12:00 M. creates an Answer node and gives it the label "WayPoint0"

28:40:00 M.: "All right. And then the only thing we want to make sure is uh [reading from screen] 'make sure that Boudreaux is in line of sight…. from AstroOne, thus move it to waypoint uh 2 and 3 at appropriate' … appropriate? 'times.' Right?"

28:46:00 M. creates an Answer node and gives it the label "Make sure that Boudreaux is in line of sight from AstroOne, thus move it to WP 2 and 3 at appropriate times."

29:22:00 A, B: "mm-hm"

29:23:00 M. links the node to "Where should Boudreaux take pictures?"

29:25:00 A.: "Nice."

29:27:00 B.: (murmuring) "Sounds good to me."

Note: This dimension, ensuring that the representation matters in the session and is not just a sideshow or decoration, is possibly one of the clearest indications of the difference between skilled/expert and less-skilled/novice practitioners. It also appears to vary along a dimension of the *specificity* with which this occurs. The higher-ranking sessions were very specific in what they asked participants to look at – specific nodes, links, screen placement, or wording; while the lower ranking sessions' participants merely gestured at the screen in a general way, not pointing at specific items.

Both RG2 and AG4 also had a high degree of getting participants to look at and engage with the representation, employing physical means like walking up to the screen and pointing at specific content several times during the session.

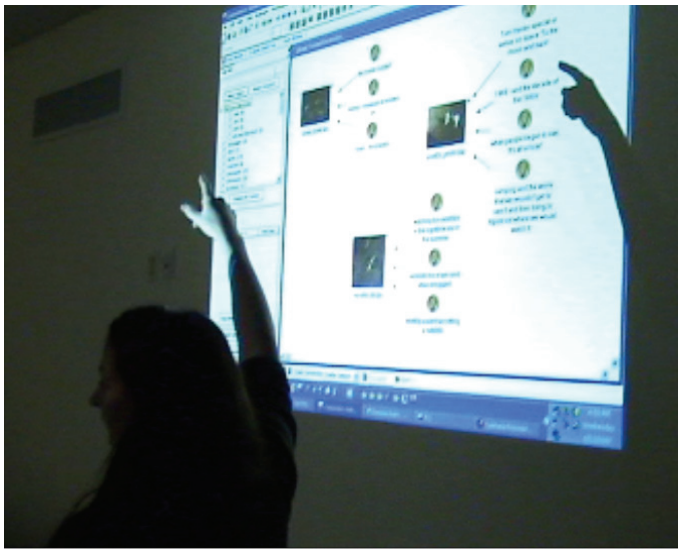


**Figure 6.18: RG2's facilitator using her arm and shadow to direct participant attention**

AG3, AG1, and RG1 all had lower degrees of this dimension. Practitioners indirectly *physically* gestured at the screen from time to time, which, although inviting, encouraging, or at least indicating that the participants should look at the screen, did not do this as actively or integrally as in the Hab, RST, RG2, or AG4 sessions. AG2's mapper did have one very active instance of this early in the session, though none following it; the facilitator gestured in a general way toward the screen during her initial walkthrough of the map, but not after that.

### 6.4.8 Relating dimension C.8: Degree of collaboration between practitioners

| | High | | | | | Low |
|---|---|---|---|---|---|---|
| C.8. Degree of collaboration between multiple practitioners (if applicable) | RG2<br>High | AG4<br>High | AG3<br>Med | RG1<br>Med<br>Low | AG1<br>Low | AG2<br>Low |

Degree of collaboration between practitioners is a *collaboration* dimension, referring to the degree and style with which practitioners collaborated with each other (the two Mobile Agents sessions, with their sole practitioners, are not considered here). It falls into the *ethics* component of the conceptual framework, in this case having to do with sharing and communication between the practitioners (as opposed to between practitioners and participants), relating to choice-making

about how people will be brought into the session's intentions and direction.RG2 exhibited the highest degree of such collaboration, even calling temporary halts to the proceedings so that the mapper and facilitator could work directly together to catch up and reshape the maps as needed, including *physical* collaboration (working together over the same laptop; see Figure 6.19).

**Figure 6.19: RG2's facilitator and mapper collaborating to catch up and reshape the map**

In a very different way, AG4's practitioners appeared to be a team quite experienced in working together (though in fact they never had), with the facilitator "throwing bones" to the mapper, giving her direct input on how to work nodes or shape the map, as well as giving her time to catch up, and providing validation of the mapper's changes. AG3 had some explicit such collaboration, though less so than RG2 or AG4. In the case of the RG1 session, there was really only one principal practitioner, D., who did both facilitation and mapping, but the other members of the practitioner team (from their seats among the participants) did provide verbal clarification of the purpose of the exercise and its activities, and also commented on the appropriateness of specific participant contributions. AG1's session had little direct collaboration; the roles of facilitator and mapper were strongly demarcated (set apart from each other) with little or no direct interaction, though there was some sense that

they were working together. AG2's practitioners exhibited no explicit collaboration during their session.

### 6.4.9 Relating dimension C.9: Degree of collaboration between practitioners and participants

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| C.9. Degree of collaboration/co-construction between practitioners and participants | Hab<br><br>High | RST<br><br>High | AG1<br><br>High | AG4<br>Med<br>High | RG2<br><br>Med | RG1<br><br>Med | AG3<br>Med<br>Low | AG2<br><br>Low |

Degree of collaboration between practitioners and participants is a *collaboration* dimension, referring to the degree and style with which the practitioners "opened up" their conduct of the session so that the work (particularly, but not solely, that concerned with the representation itself) was done in cooperation with the participants, as opposed to non-collaborative approaches such as top-down or directive, practitioner-driven style, or a bottom-up, participant-driven session. It is a function of the *relationship between the practitioner and participants* and demonstrates practitioner *ethics* in the choices the practitioners make about how much collaboration/co-construction to enter into, foster, or avoid. To some degree it can be a function of the *methods* that practitioners choose to employ in the session.

At the high end of the rankings, the Hab session was pure co-construction throughout the session, from topic selection to wording to the time and depth with which a topic was treated to deciding when a task was completed. Both participants and practitioner were directly engaged in co-constructing the maps throughout the session. The RST session had a slightly lower (though still high) degree of such collaboration, because much of the work was more clearly parceled off or demarcated into different roles (e.g. the geologists as analysts while the practitioner was more the map-minder), but there were many episodes of genuine co-construction during the session. In a very different way, AG1 also had a high degree of collaboration, in this instance due to all of the problems that arose during the session. There was very direct collaboration between participants and

practitioners in deciding what and how to recover from the problems. AG4 had a fairly high but somewhat lesser degree since the participant and practitioner roles were more demarcated, with the facilitator in some ways standing apart from the determination of the map contents while retaining complete control of the process and form. RG2 and RG1 had even stronger practitioner ownership of the process and form, with their highly –re-structured processes and relatively strict demarcation of roles. By contrast, AG3's session started off with a high degree of co-construction, with all engaged in figuring out how best to do the tagging exercise, but this tailed off as the session went on. AG2's session exhibited no real collaboration between practitioners and participants, especially in terms of shaping the representation itself.

## 6.5 Category D: Shaping

The seven dimensions analyzed in Category D comprise aspects that characterize the ways that practitioners shape the artifacts and representations in the studied sessions. This category is at the heart of this research's chief concern, the area with the least directly applicable existing research literature: what makes participatory representations worthwhile, and what actions on the part of practitioners make the difference in terms of their coherence, usefulness, and engagement? How do practitioner actions work (or fail) to align the representations with the purpose(s) of a meeting and the way participants communicate and interact with each other? The dimensions analyzed in this category are, in general, less easy to observe and discuss than the primarily verbal and physical aspects covered in the three previous categories. But representations need shaping or they are inert and lifeless. Since they can be persistent (lasting beyond the boundaries of the meeting itself, and used for future audiences and purposes), they are less evanescent than the contents of the meeting itself. They can matter more or less to the participants during the meeting, and more or less to future users. In both cases, practitioner shaping actions make various kinds of difference to a representation's effectiveness. The dimensions in this category seek to highlight these actions and their kinds of consequences.

Findings from the Shaping dimensions are summarized in Table 6.5.

**Table 6.5: Summary of Category D – Shaping**

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.1. How much attention to textual refinement of shaping | Hab | RST | RG1 | RG2 | AG3 | AG4 | AG1 | AG2 |
| D.2. How much attention to visual/spatial refinement of shaping | RST | AG3 | Hab | RG2 | RG1 | AG1 | AG2 | AG4 |
| D.3. How much attention to hypertextual refinement of shaping | RST | AG3 | RG2 | Hab | AG1 | RG1 | AG4 | AG2 |
| D.4. Degree of 'finishedness' of the artifacts | RST | Hab | RG2 | RG1 | AG3 | AG2 | AG1 | AG4 |
| D.5. Density of practitioner shaping moves (frequent vs. infrequent) | AG4 | RG2 | AG1 | Hab | RST | AG3 | AG2 | RG1 |
| D.6. Complexity of the software techniques in use | RST | Hab | AG3 | RG2 | AG1 | AG2 | RG1 | AG4 |
| D.7. Degree of 'exclusive'/de-linked practitioner interaction with the representation | RST | RG2 | AG2 | AG3 | AG4 | AG1 | RG1 | Hab |

Sections 6.5.1 through 6.5.7 describe each Shaping dimension in more detail.

### 6.5.1 Shaping dimension D.1: Textual refinement

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.1. How much attention to textual refinement of shaping | Hab<br>High | RST<br>High | RG1<br>High | RG2<br>High | AG3<br>High | AG4<br>Med<br>High | AG1<br>Low | AG2<br>Low |

Textual shaping refers to paying attention to what words in the representation say and how they say it. *Refinement* is a key aspect of this, referring to practitioner actions that ensure that the textual content of the representation is expressive, economical, and purposeful. The dimension falls into the *aesthetic* component of the conceptual framework. It is a characteristic of aesthetic shaping of the representation itself.

Most of the studied sessions had a high degree of textual refinement. The Hab session's participants and practitioner negotiated, refined, discussed, and revised node labels throughout the session, with all concerned heavily engaged in making sure they got the (mostly terse) labels "right." This was fitting since they were creating materials that would be used by other people and systems later on. The RST session was similar, focusing on the text of tag names as well as node labels. There were many statements such as "Should we label this…" and "I called it…," referring to efforts to achieve most accurate meanings, such as the exchange in Figure 6.21:

| Start | End | Participant statement | Practitioner action | Practitioner statement |
|---|---|---|---|---|
| | | | | "Uh… what are we calling this, the revised nomenclature?" |
| 36:04:00 | 36:06:00 | "Yeah the revised methodology, I guess…" | | |
| | | | S types "revised methodology" after "the" | |
| 36:11:00 | | | | "OK" |
| 36:15:00 | 36:19:00 | | S highlights the node | |
| | | | S goes to Tags toolbar and pulls the Tags drop-down down to highlight "RST summary-key" | |
| | | | | "I changed this Tag from 'summary-critical' to 'summary-key' cause critical has got the wrong connotation." |
| 36:23 | | "Yeah, g…" "Yeah" | | |

**Figure 6.20: Excerpt from RST Grid illustrating textual refinement**

The RG1, RG2, and AG3 sessions also spent much of their time developing and refining textual node labels and tag names. There was no appreciable degree of textual shaping in the AG1 and AG2 sessions.

### 6.5.2 Shaping dimension D.2: Visual/spatial refinement

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.2. How much attention to visual/spatial refinement of shaping | RST<br>High | AG3<br>High | Hab<br>Med<br>High | RG2<br>Med | RG1<br>Med | AG1<br>Med<br>Low | AG2<br>Low | AG4<br>Low |

This dimension assesses the direct attention to and refinement of the appearance, layout, and arrangement of the visual elements of the representations (nodes, links, images, etc.) during the sessions. The dimension falls into the *aesthetics* component of the conceptual framework. It is a characteristic of aesthetic shaping of the representation itself.

The RST session had the highest degree of visual/spatial refinement. The practitioner, S., demonstrated intentional, careful shaping throughout the session, arranging the visual materials to make certain kinds of points clearly and expressively. Figure 6.21 shows an example from the sensemaking episode.

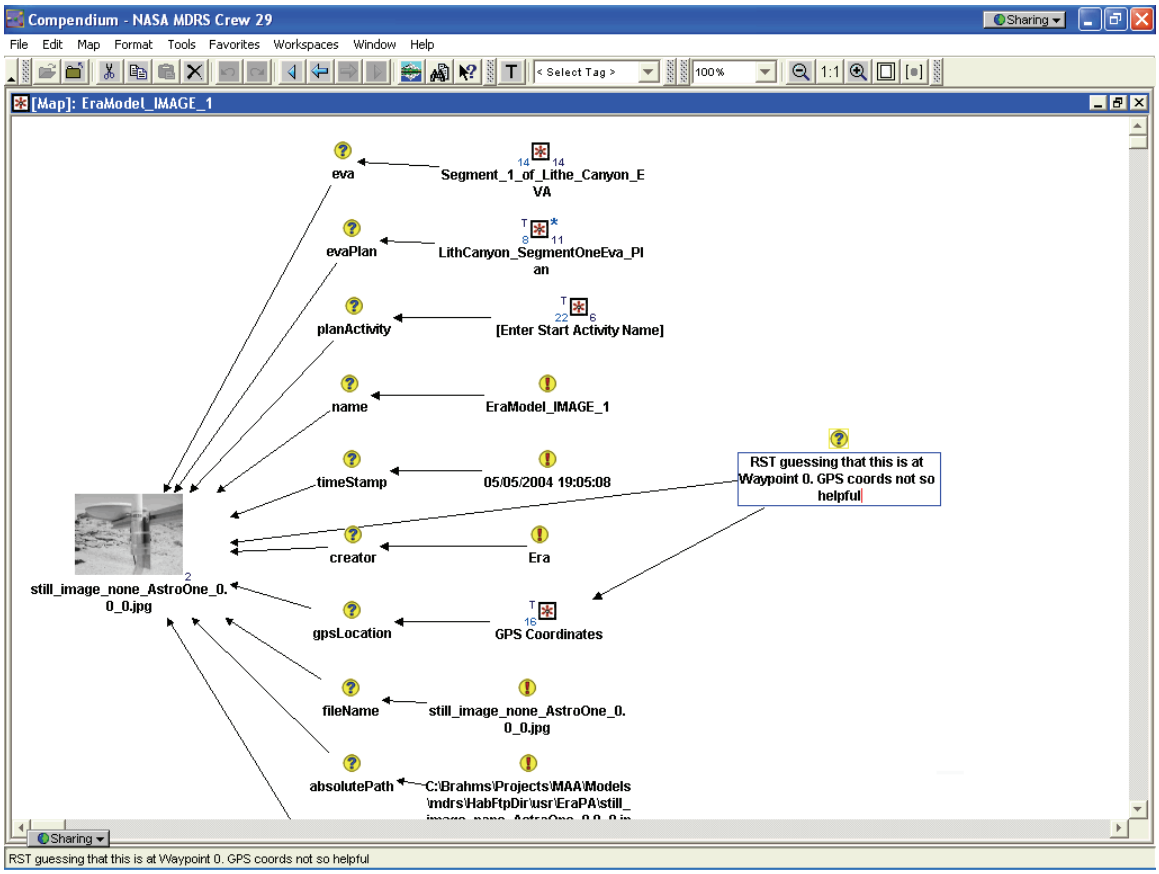



**Figure 6.21: RST screen showing placement of the "RST guessing" node and links**

In this example, S. chooses to set a new 'comment' node in white space to the right of the rest of the nodes in the map, emphasizing its separateness from them and the nature of the comment it is making. He also chooses to link the node to the main image node, drawing the link across all the other nodes in the view, which serves to make it more dramatic, and possibly effective, emphasizing the disruptive quality of the missing information and the effect it had on the RST. The making of the second link from "RST guessing…." is drawn in such a way that the link lines do not cross over any other nodes further reinforces this (in fact S. moves the node precisely to achieve this, after an earlier placement had shown the links crossing some of the pre-existing links).

The AG3 session also had a high degree of visual shaping. Their prepared map was a complex and carefully constructed visual structure, including white (and thus intentionally invisible) Responds-To links between some of the nodes. They devoted much energy to keeping the map faithful to their

intended structure while also incorporating the participant contributions in succinct and readable ways (to keep the representation *economical*), though without as much emphasis on appealing appearance as in the RST case.

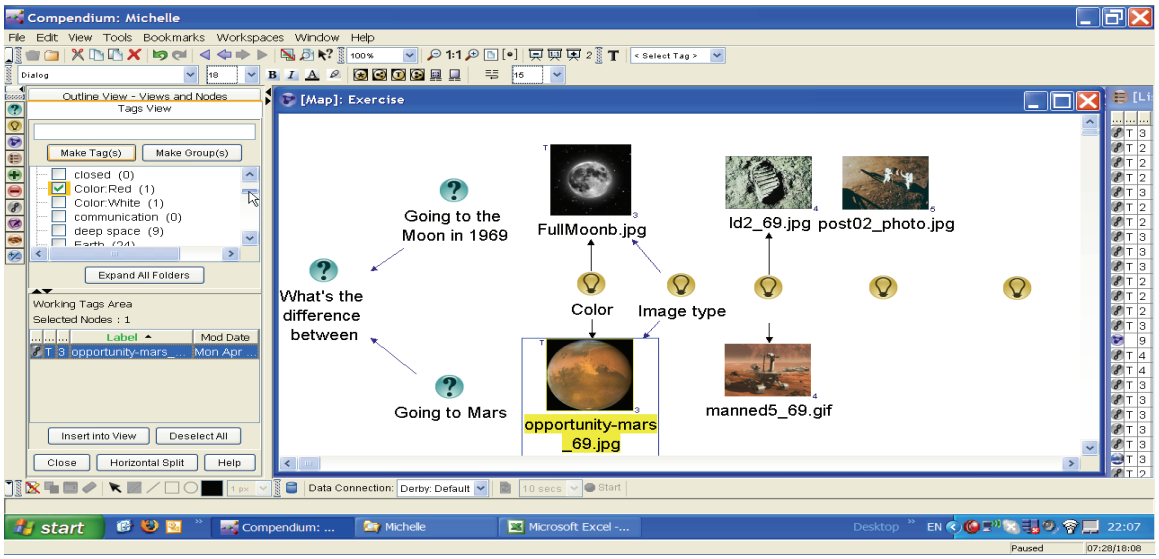



**Figure 6.22: AG3's map containing hidden links**

The facilitators refer to this while in the course of the mapper performing the rather complex operations required to keep the map up to date, as in this excerpt from timeslot 13:

> J. (facilitator): And and for the record, folks, there is a, a responds-to arrow from each of those Idea nodes back to the original Question but we made it white…
>
> H.: (facilitator) Yes.
>
> J.: So that it wouldn't clutter up the image.
>
> Mi: (mapper) [talking to herself, while accomplishing the tagging] So that one is….
>
> H.: We wanted a nice, clean map. [laughs] Simple map.
>
> Mi: OK? Is that what people wanted?
>
> H: So…

Mx: (participant) Yeah I can't, y'know, I can't read the text… I'm sure it is fine.

The two Rutgers sessions, RG1 and RG2, had a lower degree of visual refinement, mainly in keeping the groupings of image nodes and their connecting and labeling nodes visually distinct and uncluttered (see Figure 6.23). Both groups treated the image nodes themselves as central visual "magnets" and oriented their visual treatments around them, which only AG3 did among the Ames sessions (the other Ames sessions treated image nodes in a more peripheral manner, not focusing on them per se during their sessions).

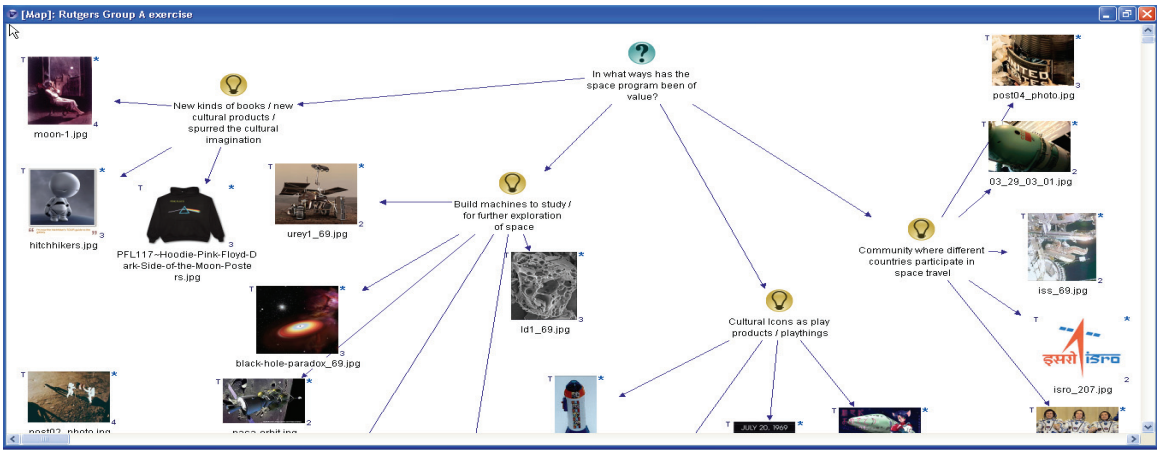



**Figure 6.23: RG1's spatial arrangement of image and annotation nodes**

AG1 did some minor visual shaping in creating a second map to hold the content of the "meta" discussion (the "Critical Thinking" map node in Figure 6.24, creating more room in the cluttered main map, but otherwise, like AG2 and AG4, limited their visual shaping to some making-things-fit rearrangements of nodes and links.

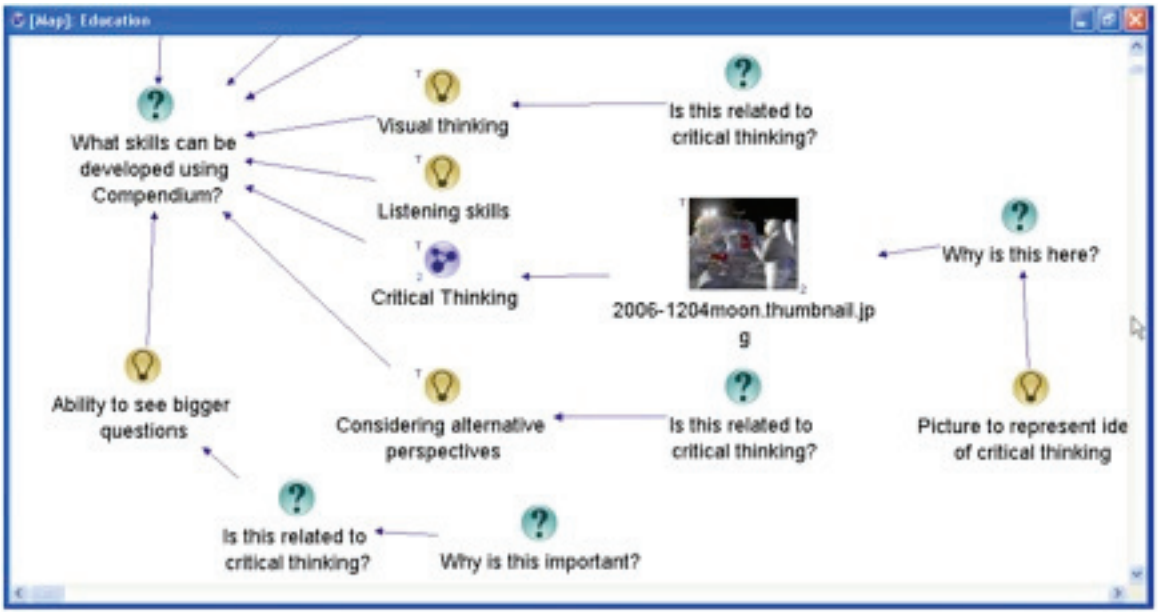



**Figure 6.24: AG1's map created to hold the "meta" discussion ("Critical Thinking")**

### 6.5.3 Shaping dimension D.3: Hypertextual refinement

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.3. How much attention to hypertextual refinement of shaping | RST<br>High | AG3<br>High | RG2<br>Med<br>High | Hab<br>Med | AG1<br>Med<br>Low | RG1<br>Low | AG4<br>Low | AG2<br>Low |

Hypertextual shaping refers to the intentional use of hypertext features such as linking, tagging, and embedding for expressive purposes. This is as distinct from the *use of hypertext features*, such as the embedding that the Hab crew took advantage of in their search for relevant content during their session, vs. actual *hypertextual shaping* where the various features are used directly and intentionally to shape the meaning or impact of the representation. The dimension falls primarily into the *aesthetic* component of the conceptual framework, though it also falls into *software* since only sessions employing software that supports hypertext functionality would qualify for this dimension. It is a characteristic of aesthetic shaping of the representation itself.

The RST session had the most such hypertextual shaping of the studied sessions, using tags, templates, embedding, and other features to perform careful and intentional shaping of their maps. This was particularly evident in the shaping of the reporting and summary maps (see Figure 6.25). S.,

the mapper/facilitator, worked hard (in many delinked segments) to retrieve nodes and embed them carefully in the summary maps, with the intent of facilitating hypertextual navigation by later users. The session went the farthest in terms of true hypertextual *authoring,* taking advantage of uniquely hypertextual features, as distinct from the less hypertextually rich, mostly boxes-and-arrows diagrams that the other sessions created (which could have been rendered just as well with non-hypertext software, such as a drawing or diagramming package).

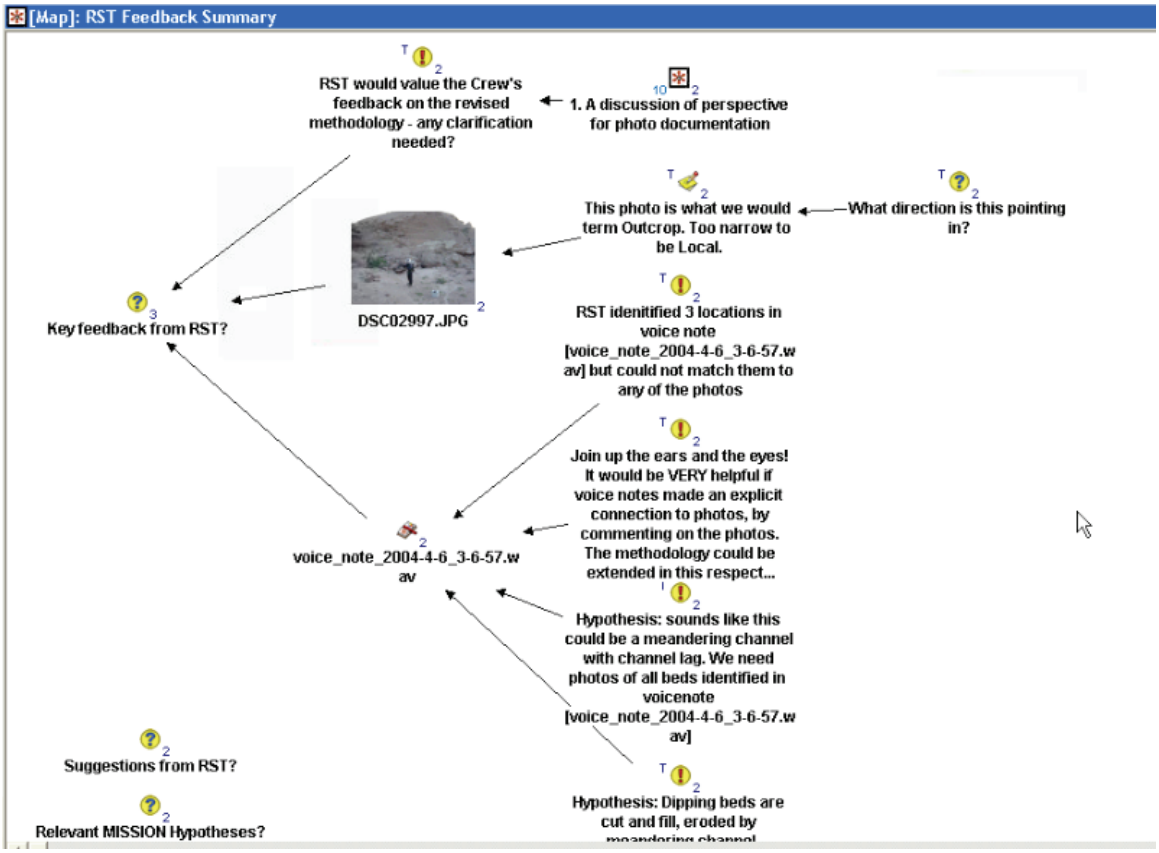



**Figure 6.25: RST summary map showing embedded references to issues from the session**

AG3's practitioners also devoted much time and attention to the specifics of their rather intricate tagging and linking scheme, debating what each should mean within the exercise's intended purpose. Indeed, much of the session's discussion and mapping effort concerned these aspects and how they should or shouldn't be reflected in the map (which also gave rise to the "meta" topic that consumed the final moments of the session).

The RG2 practitioners also focused much attention on how to shape their tags, discussing whether to express the "memory" tags with multiple textual concepts or as separate tags. Figure 6.26 shows the result of their decision to accommodate divergent participant opinions about how to categorize the memories by representing as separate tags.

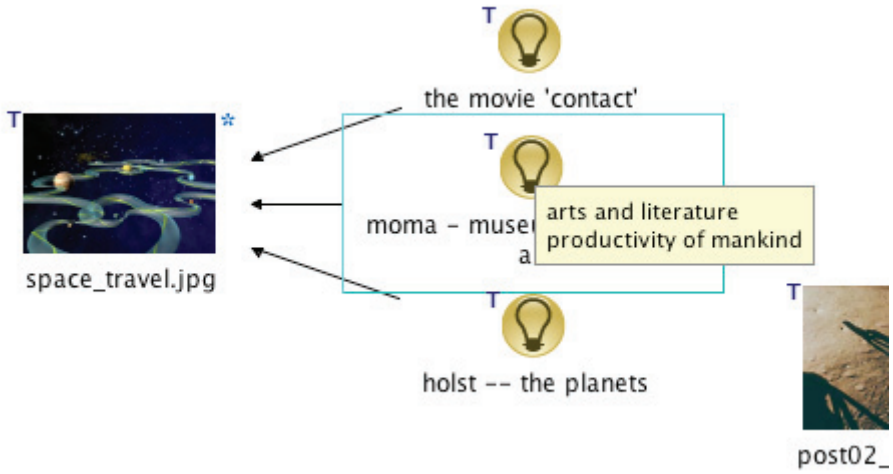



**Figure 6.26: Portion of RG2's map showing "memories" captured as separate tags**

The Hab session had a lower degree of hypertextual shaping, mostly consisting of some intentional embedding of nodes from an older map once they had searched for and found the content they were seeking for the map they'd been working on. This, though certainly qualifying as hypertextual shaping, was more *serendipitous* than the more intentionally hypertextual shaping of RST, AG3, and RG2. Figure 6.27 shows the two retrieved nodes ("Letter Letter / Digit Digit / Digit Digit" and "NOTE ON SAMPLE BAG Naming.") embedded into the final map, replacing nodes the group had earlier been working with once they realized they had already covered the sample bag nomenclature issue in a previous discussion.

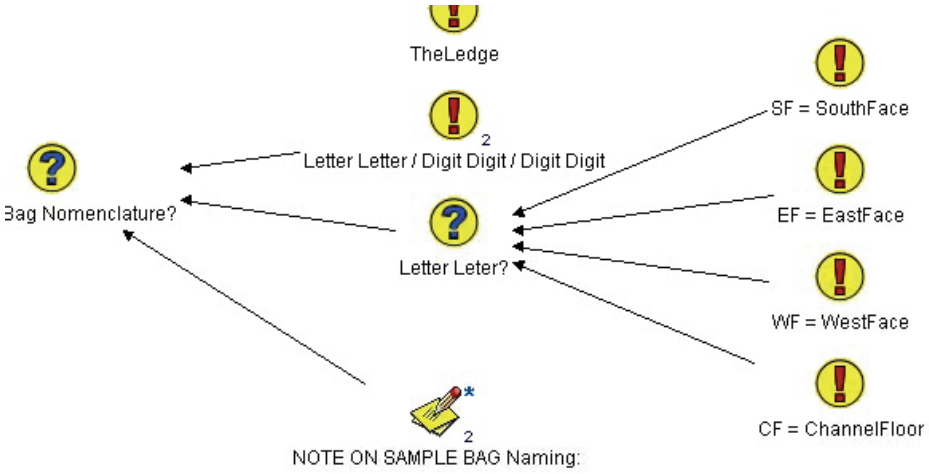



**Figure 6.27: Serendipitous embedding at the end of the Hab session**

Hypertextual shaping during the AG1 session was limited to one sub-map creation and associative linking. The RG1, AG2, and AG4 sessions did not include significant hypertextual shaping beyond the creation of associative links on a single map.

### 6.5.4 Shaping dimension D.4: "Finishedness" of the artifacts

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.4. Degree of 'finishedness' of the artifacts | RST<br><br>High | Hab<br>Med<br>High | RG2<br>Med<br>High | RG1<br>Med<br>High | AG3<br>Med<br>Low | AG2<br><br>Low | AG1<br><br>Low | AG4<br><br>Low |

This dimension is concerned with the degree of aesthetic completeness at the conclusion of a session; how far along the practitioner shaping had reached in tying up loose ends or otherwise perfecting the textual, visual, and hypertextual form of the maps. Finishedness is in some ways a superset of the three earlier shaping dimensions, since it can comprise any or all of them, but this dimension focuses more on the temporal aspect; it is concerned with the appearance of the representation at the end of a session while the others treat shaping at any time during a session. The dimension falls into the *aesthetic* component of the conceptual framework. It is a characteristic of aesthetic shaping of the representation itself.

The RST session devoted the most time and energy to shaping the "finish" of its maps, particularly in updating the "portal" and "summary" maps so that they could be as usable as possible by other teams (see Figure 6.25). The Hab, RG2, and RG1 sessions all had a lower degree of finish, in different ways. While the Hab's mapper/facilitator, M., did not devote as much effort toward refining his maps' presentation, he did perform a good deal of visual and textual shaping along the way to ensure that the end product was clear and succinct. RG2's simple map was carefully constructed and cleanly finished at the end (see Figure 6.26), similarly, within its modest, single-map structure, RG1's concluding map was very clean (see Figure 6.23). The AG3 session could have achieved a higher degree of finish – it was certainly the intent of the practitioner team to keep their map structured according to the careful pre-planning – but the rise of the "meta" topic towards the end of the session left some nodes hanging and not integrated (see Figure 6.28).

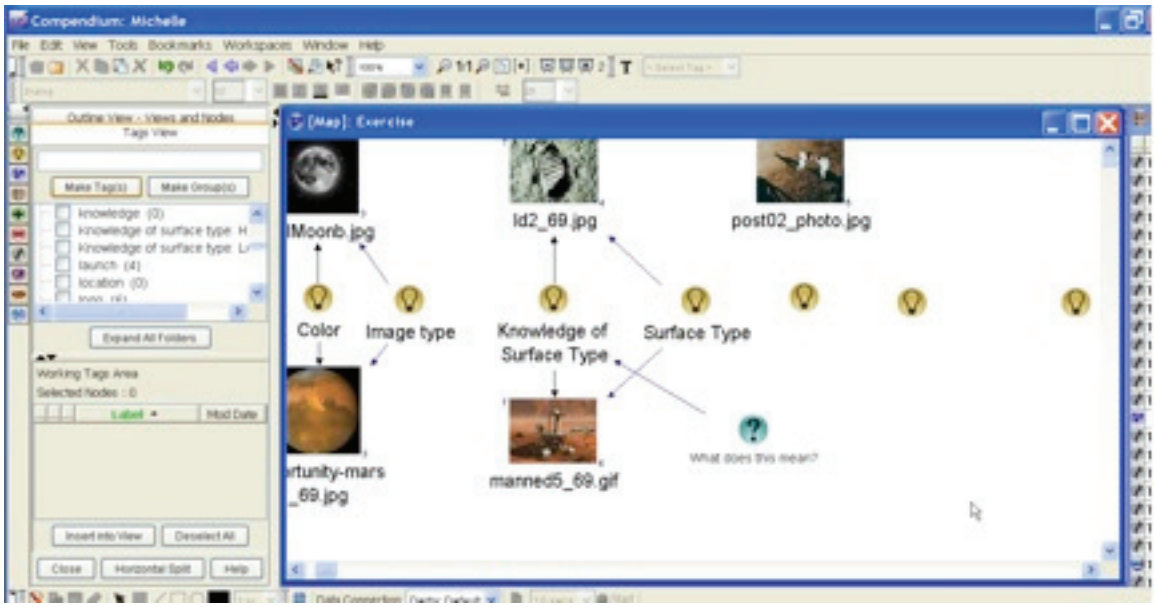



**Figure 6.28: Hanging nodes at the end of AG3's session**

The remaining sessions – AG1, AG2, and AG4, which were also three of the four most "discussion-centric" (see section 6.2.5) by intention (see section 6.3.1) – did not devote significant "finishing" effort to their representations, at least in part due to the absence of a clear ending point in their exercise design.

### 6.5.5 Shaping dimension D.5: Density of shaping moves

| | Higher | | | | | | | Lower |
|---|---|---|---|---|---|---|---|---|
| D.5. Density of practitioner shaping moves (frequent vs. infrequent) | AG4 | RG2 | AG1 | Hab | RST | AG3 | AG2 | RG1 |

This dimension is a simple counting of the number of practitioner verbal or software moves during the sensemaking episodes that have text or maps as at least one of their focus aspects. That is, it looks at how many of the moves could be said to have a "shaping" aspect, since they are concerned with the textual, visual, or hypertextual properties of the representation. The specific ratios are shown in Table 6.6. It falls into the *aesthetics* component of the conceptual framework.

While subject to the same limitations as discussed in section 6.2.2, the data are nonetheless interesting as they help to shed light on the *character* of practitioner actions during sensemaking episodes, a facet that is intrinsically related to the specific context, practitioner style and skills, types of interaction with participants, and other situation-specific characters (as opposed to being some type of dependent variable; if such a causal relationship exists, it would require further data analysis to determine). Since the data at hand are limited to moves made during the sensemaking episodes (which were themselves largely identified as moments that involved representational issues of some kind), it is not surprising that all of the sessions scored over 50%, with five of the eight more than 85% of shaping moves.

**Table 6.6: Density of practitioner shaping moves**

| Session | Ratio of shaping moves |
|---|---|
| AG4 | **94.4**% (34 of 36 moves) |
| RG2 | **92.3**% (24 of 26 moves) |
| AG1 | **91.3**% (84 of 92 moves) |
| Hab | **88.4**% (84 of 95 moves) |
| RST | **85.7**% (24 of 28 moves) |
| AG3 | **74.4**% (64 of 86 moves) |
| AG2 | **57.1**% (4 of 7 moves) |
| RG1 | **56.3**% (9 of 16 moves) |

The highest proportion of shaping moves was in the AG4 session. This was due to a high amount of cleanup moves made on the map while participants were making long verbal contributions, and effective teamwork between the mapper and the practitioner to "stage" the contributions so that the mapper could do the cleanup work while not missing anything. An example is in the segment starting in timeslot 22, at (Camtasia timing) 15:08 of the session. A participant, E., makes a fairly long speech to think through and establish a point he wanted to make:

> E. : I think also sort of one of the underlying things I do not think it was exactly J's point but I think it is relevant here is, is um, people are more uh invested in something if they feel like they are co-creators? Like they're part of it? So if there are ways to involve the public like in terms of decision-making, like if you had contests where the public could actually come up with an advertisement for an example.

During this speech, mapper L. was doing clean up moves in various places around the map. At C15:19 she moved the cursor around as if searching for the right place on the map to capture the point, settling on a place at 15:24, which she then moves to two different places until 15:28. At 15:29 before E. stops speaking, she starts typing "contests" but then backspaces over it as facilitator D. starts rephrasing/summarizing, then deletes the node at 15:37 in response to D's "if we put a question" at 15:33, creating a Question at 15:39. D. then prompts L. to create specific Idea nodes in response, and also directs/simultaneously narrates at C15:51 as L. scrolls the map up so the question can be seen more easily on the map.

> [C15:32] D: So if we put a question that said how could the public become co-creators? Of the program? And then let's capture a couple of your, your ideas about that.

D.'s verbal moves here provide a "plan" for L. to follow. As L. starts to create the Idea "contest for commercial," D. makes the above statement: "So if we put a question that said how could the public become co-creators?" This prompts L to abandon the node (first erasing the text then deleting the

node itself) then creating the new Question "How could the public become co-creators of the project?" That takes from C15:39 through C15:50, while D. had already finished the above speech. Since the new Question's label displayed below the bottom of the visible map, L. moves over to the right scrollbar to scroll the map up, while D. simultaneously buys her time, explains what L.'s doing, and prompts her to create the next nodes:

> D: Um… I think … [C15:51] just move that up a little so we can all see it and then I think he said what was it? One was a contest for…

The results of this complex series of 36 moves, nearly all of which (94.4%) had to do with visual or textual shaping, were both a cleaned-up map (see Figure 6.29) and succinct capture/representation of the lengthy participant input.

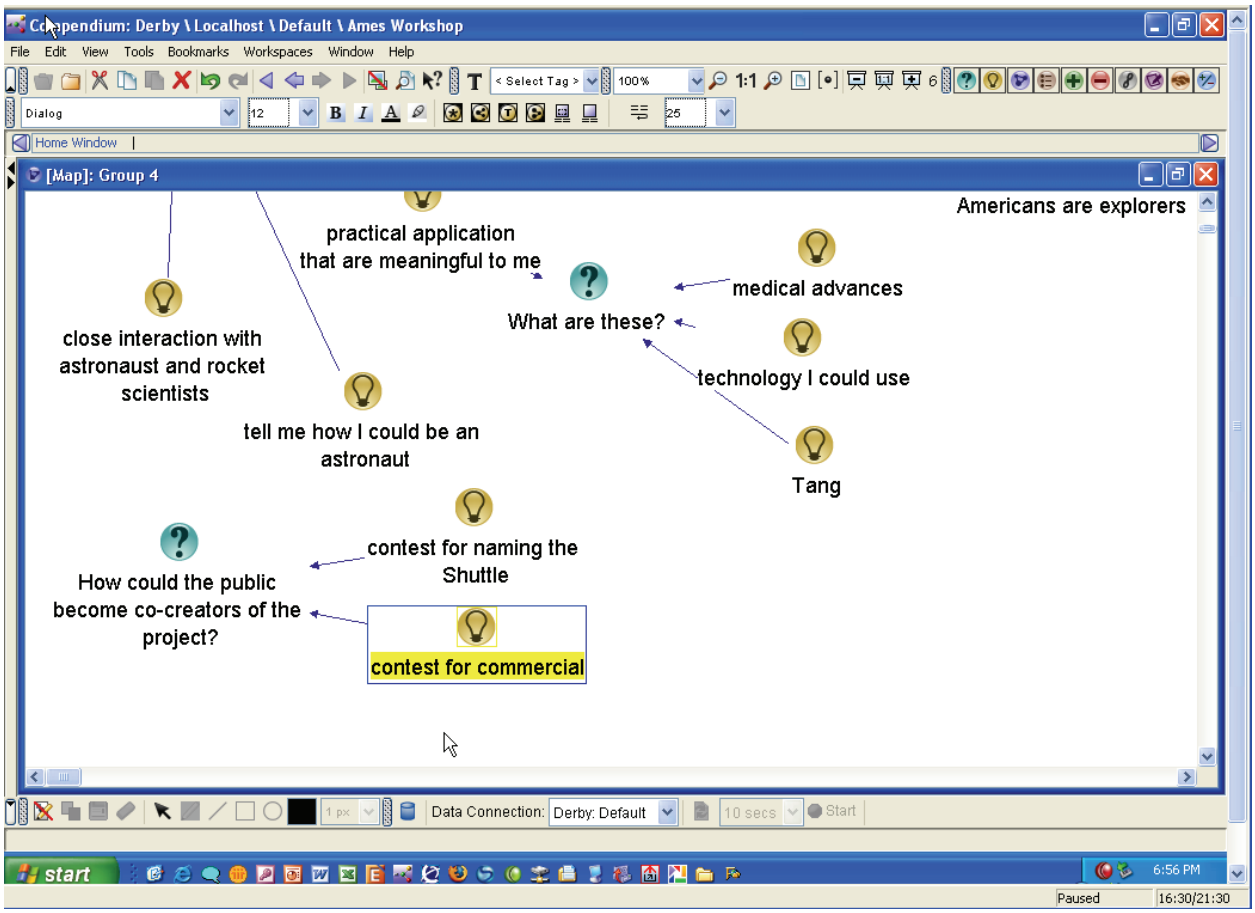



**Figure 6.29: Result of the shaping moves in AG4's sensemaking episode**

At the other end of the density of shaping moves spectrum, RG1's session has a much lower ratio – 56.3% of the 16 moves during the sensemaking episode. This is because the character of the episode was more in the nature of a discussion (with a few shaping moves) about the intent of the exercise and the kinds of answers that would "count" as "having to do with the space program." Most of the moves were verbal, clarifying statements in which the primary focus aspects were participants, matter, and process.

### 6.5.6 Shaping dimension D.6: Complexity of software techniques

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.6. Complexity of the software techniques in use | RST<br>High | Hab<br>High | AG3<br>Med<br>High | RG2<br>Med | AG1<br>Low | AG2<br>Low | RG1<br>Low | AG4<br>Low |

In context of the studied sessions, all of which used the Compendium software, the rankings for this dimension are not surprisingly quite similar to those for dimension D.24: Hypertextual refinement (see section 6.5.2). The dimension primarily into the *software* component of the theoretical framework, but also can be a function of which *technology* and *methods* are in use.

Most of the more novice practitioners (AG1, AG2, RG1, and AG4) used only a few software techniques, such as basic node creation and associative linking on a single map. A notable exception of the less experienced practitioners was the AG3 session, which employed relatively complex linking and tagging techniques, including "invisible links" (see section 6.5.2). This too is not surprising given the mapper's technical sophistication (she is, in fact, Compendium's lead software developer). The RG2 session employed some tagging techniques, while the two "expert" Mobile Agents mapper/facilitators both used the widest variety and complexity of software techniques in their sessions, employing not only a wide variety of Compendium techniques but also working with and bringing in content from other software tools during their sessions.

### 6.5.7 Shaping dimension D.7: De-linked practitioner interaction with the representation

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| D.7. Degree of 'exclusive'/de-linked practitioner interaction with the representation | RST<br><br>High | RG2<br>Med<br>High | AG2<br>Med<br>High | AG3<br><br>Med | AG4<br><br>Med | AG1<br><br>Med | RG1<br><br>Low | Hab<br><br>Low |

This dimension concerns the degree of de-linked interaction, that is, times when the practitioners focus their attention on the representation alone as opposed to interacting w/participants. This can be either because they need to concentrate on a relatively difficult or involved shaping move, a need to repair the representation, or because they are not actively interacting with the participants. There are many reasons why a practitioner would "delink" during a session, and the degree of delinked interaction does not appear to have any apparent relation to session quality nor to the coherence, engagement, or usefulness of a representation. It is possible for delinked interaction to lower the amount of participant engagement with a representation at a given moment, though delinking is often (though not always) done to repair or ensure coherence and usefulness in the face either of anomalies or of complex tasks that need to be performed on the representation. As with most of the other dimensions, this is a reflection of a session's context, constraints, roles, and behaviors. The dimension falls primarily into the *ethics* component of the conceptual framework, since it reflects how much the practitioner chooses to give direct/complete attention to the representation as opposed to interacting with the participants. Since it is often done for the purpose of shaping moves on the representation, it also often involves *aesthetics*.

This can clearly be seen in both the rankings of the two "expert" sessions here – the top ranking of the RST session and the bottom ranking of the Hab session. The RST mapper/facilitator performed a fairly high degree of delinked actions while running down issues, problem-solving, and performing complex formatting and other operations while the participants were discussing something else (in the overall context of many highly interacting actions). This is in contrast to the low-ranked Hab (and

RG1) sessions, which had very little truly delinked moments; almost every action was done with the full attention/involvement of the participants. In both the Hab and RG1 cases, the shape of the sessions, especially their same time/same place and "intact team" characteristics, as well as the high degree of focus on shared tasks between practitioner and participants (nothing needed to be or could move forward in either case without direct participant engagement, and in neither case were there complex formatting, research, or construction tasks that need to be done in isolation from the participants.

The RG2 session also had a relatively high degree of delinked interactions, in this case because of the need to catch up and figure out on the fly how to incorporate the input in the intended way on the representation, evidenced in this questionnaire comment from L., the facilitator:

> "Actually I thought it went better than we thought it would - there were some things we sort of left 'open' so that was interesting to see the actual practice. In doing the exercise, I realized we had not predefined what to do w/certain types of responses (e.g. - "no memory").

The RG2 session had several moments when the mapper and facilitator conferred together (in delinked mode) at the mapper's laptop.

In a very different way, the AG2 session also had delinked interaction during the long "schism" between the practitioners and participants after the failure of the mapper's intervention (and the facilitator's acknowledged uncertainty in how to return participants to the point. As A., the facilitator, commented in her questionnaire responses:

> "As a facilitator I had difficulties in: driving the conversation and trigger new discussion about specific topic (I was not able to focus the audience _on_ [sic] the map question)."

The AG3 session had a smaller amount of delinked interaction, primarily occurring when the mapper had to deal with some complex operations on the representation, and also when the practitioners succumbed to the "meta" topic towards the end (during which time the mapper placed the "What does this mean?" Question node on the map pictured in Figure 6.28).

There were some, but not many, periods of delinked interaction in the AG4 and AG1 sessions. In the AG4 case, the facilitator was able to 'carry' the session while the mapper worked to catch up on the map. Similarly, for AG1, there was not much truly delinked interaction, because the mapper was verbally interacting with the participants even during the 'repair' segments of the session.

## 6.6 Category E: Framing

While the preceding four categories of dimensions were derived "ground up" from the data in the individual session analyses, the seven dimensions in Category E take a more "top down" approach. They relate the sessions to selected components of the Framing model discussed in Chapters 2 and 4. The Framing model creates a normative practice model against which to compare specific aspects of practitioner behavior and stance in the observed sessions. The dimensions described in this section cover aspects not – or under-addressed in the preceding four categories.

The first three dimensions concern facets of Framing model element A.2, which concerns *narrative framing* – the canonicity, causality, purpose, roles and relationships that appear to inform practitioner actions in a session.

### 6.6.1 Framing dimension E.1: Narrative Consistency and Usefulness (A.2.2)

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| E.1. Narrative Consistency and Usefulness (A.2.2) | Hab<br>High | RG2<br>Med<br>High | RST<br>Med<br>High | AG3<br>Med | AG4<br>Med | RG1<br>Med | AG1<br>Med<br>Low | AG2<br>Low |

- Component (A) Towards the practitioner's own involvement (self in situation)
  - Element (A.2) Constructing narratives to account for how the situation arrived at the current pass (Schön); causes and breaches in canonicity (Bruner)
    - What is its degree of internal consistency? How useful is it?

This dimension concerns the conceptions of *consistency* and *usefulness* of the practitioners' guiding narrative, specifically how consistent and useful the guiding narrative(s) prove to be in the heat of practice. The dimension falls primarily into the *narrative* component of the conceptual framework as it is directly concerned with narrative framing, not other sorts of practitioner action, though it can touch on nearly all of the other components.

The Hab session's narrative construction was highly consistent and useful. The only breaches came between narratives – e.g. the concerns of the particular meeting in the context of the larger Mobile Agents project in general and other activities going on in the environment during the session, which resulted in several interruptions and determinations of which was more important. The guiding narratives for the RST and RG2 sessions were as consistent, though slightly less useful. In the case of RG2, no breaches emerged during the unfolding of their guiding narrative in the large group session. The 'usefulness' of the exercise might have become more apparent had they moved on to the planned third activity, which they ran out of time for. For RST, the guiding narrative lent a high degree of can-do pragmatism to the proceedings, guided by the consistency of purpose. At times some of the infrastructure of pre-planned formalisms and the complexity of the automatically-generated science data appeared to slow things down somewhat.

A lower (Medium) degree of narrative consistency and usefulness characterized the AG3 and AG4 sessions. For AG3, the narrative was strong except when the meta-discussions occurred; the planned exercise neither contained nor explained such divergences. For AG4, there were several moments when the practitioners had to think and discuss how something fit in, but they were able to construct containers that included the contributions fairly seamlessly throughout. RG1's narrative consistency and usefulness was rated Medium since the meaning of the framing narrative was not perfectly clear to the participants at times. However it was consistent enough to serve with little challenge or disruption through the exercise.

Both the AG1 and AG2 sessions rated Low for this dimension. For AG1 this was because the usefulness of the intended narrative broke down in the face of the discussion that was spawned. However with the various actions and interventions, equilibrium was restored and canonicity resumed more or less according to the original intentions. For AG2, the narrative's consistency was not apparent to the participants. The form of the map was too busy and scattered to convey the intended form and content of the session, and instructions from the facilitator and mapper did not convey the consistency. The intended narrative was not all that useful in terms of generating engagement with the map. Part of the intended narrative frame was that the map itself would serve as a sufficient trigger for engagement and discussion, which it did not.

### 6.6.2 Framing dimension E.2: Inclusiveness of the Narrative Framing (A.2.3)

<table>
<tr><td colspan="2">The narrative was "strong" enough to surround everything, no need for special intervention</td><td colspan="3">Required active practitioner intervention to create the inclusiveness</td><td colspan="2">Emergent splinter / competing narratives took over</td><td>Some participants could not break into or become part of the intended narrative</td></tr>
<tr><td>RST<br><br>High</td><td>Hab<br><br>High</td><td>AG4<br><br>Med High</td><td>RG1<br><br>Med High</td><td>RG2<br><br>Med High</td><td>AG3<br><br>Med Low</td><td>AG1<br><br>Med Low</td><td>AG2<br><br>Low</td></tr>
<tr><td colspan="8">• Component (A) Towards the practitioner's own involvement (self in situation)<br>o Element (A.2) Constructing narratives to account for how the situation arrived at the current pass (Schön); causes and breaches in canonicity (Bruner)<br>▪ How inclusive is it?</td></tr>
</table>

This dimension is a further specific facet of element A.2, focusing on the degree to which the practitioners' guiding narratives were inclusive enough to "contain" the events and participants during the session. The dimension falls primarily into the narrative component of the conceptual framework as it is directly concerned with narrative framing, not other sorts of practitioner action, though it can touch on nearly all of the other components.

For the two expert sessions, RST and Hab, the guiding narratives were "strong" enough to surround and explain (give context for) everything that occurred during the sessions, with no need for special intervention to explain or extend them (unsurprisingly given the “in situ” nature of the sessions). For the RST session, even the disruptions and surprises caused by the lack of expected science data were opportunities to make observations according to the narrative of “technology discovery.” Similarly, although in the Hab session there were several slight fissures between the knowledge (what’s obvious to) the geologist participants and that of the practitioner, these were swiftly and collaboratively resolved.

The three Medium High sessions – AG4, RG1, and RG2 – all required some active practitioner intervention to create the inclusiveness. Although AG4’s guiding narrative worked to contain all of the contributions, some participant contributions required the practitioners to work hard to figure out how to get them to fit in (though they were successful). RG1’s narrative was less than fully inclusive since the participants did question it and even proposed or guessed competing narratives, but with active reinforcement from the practitioners, it did serve to contain the contributions. The RG2 session’s narrative was in general very inclusive, but some fissures in inclusiveness emerged over the issue of “ownership” over tags associated with the memory nodes. In general the activities and performance of the exercises were very inclusive. All the participants were engaged and each given equal and non-prejudicial chances to contribute.

The two Medium Low sessions both had emergent splinter or competing narratives take over sessions. For AG3, although generally the participants seemed to embrace the exercise, at least to engage in it and discussing it, the practitioners were not able to come up with a surrounding, inclusive narrative to contain the “meta” discussions. For AG1, the intended narrative set up a canonicity of a cleanly unfolding discussion, tagged answers with images in response to the clear questions. However the answers started spawning a “meta” discussion that breaks down, and the practitioners were not able to be completely inclusive of all the contributions.

AG2's Low rating was because of the difficulty participants had with breaking into or becoming part of the intended narrative. The practitioners' intended "sex in space" narrative did generate an active discussion. However, it was not as expressed in the map itself or via engagement with the map.

### 6.6.3 Framing dimension E.3: Evocativeness of the Narrative Framing (A.2.3)

| Quite evocative, due to the in situ nature, engagement and familiarity of the participants with the subject matter and processes, and sense of urgency | | Quite evocative for some participants but less so for others | The framing of the subject matter was evocative in the sense of provoking engaged discussion for many of the participants | With a fair amount of intervention from the practitioners, evocativeness emerged | | Somewhat less evocative and compelling because an unintended other narrative kept breaking through | Evocative in inviting engagement, but splintered somewhat in the emergence of meta-narratives |
|---|---|---|---|---|---|---|---|
| RST | Hab | RG2 | AG2 | AG4 | RG1 | AG1 | AG3 |
| High | High | Med High | Med | Med | Med | Low | Low |

- Component (A) Towards the practitioner's own involvement (self in situation)
  - Element (A.2) Constructing narratives to account for how the situation arrived at the current pass (Schön); causes and breaches in canonicity (Bruner)
    - How evocative is it?

This dimension is a further specific facet of Framing element A.2, focusing on the degree to which the practitioners' guiding narratives were evocative, spurring participant imagination, creativity, or engagement ("suspension of disbelief") during the session. The dimension falls mainly into the *narrative* component of the conceptual framework. However, sometimes practitioner action with participants (sphere of *ethics*) brought out the evocativeness more, and sometimes the way the practitioner shaped the artifacts made them more or less evocative (sphere of *aesthetics*).

The RST, Hab, and RG2 sessions all displayed highly evocative narratives. For the Hab and RST sessions, this was due to the session's "in situ" nature, the engagement and familiarity of the participants with the subject matter and pre-determined processes, and the sense of urgency

participants and practitioner shared to complete the tasks within their allotted time. During the Hab session there were several slight fissures between the knowledge (what's obvious to) the geologist participants and that of the practitioner, but they were swiftly and collaboratively resolved. For the Medium High RG2 session, the narrative framing, with its emphasis on personal memories, was quite evocative for some participants, but less so for others.

Despite its other problems, the AG2 session's subject matter framing was evocative, provoking engaged discussion for many of the participants. For the other Medium sessions, AG4 and RG1, evocativeness emerged as a result of a fair amount of intervention from the practitioners to explain and reinforce it.

The Medium Low AG1 session's narrative was somewhat less evocative than others, or at least less compelling, because the unintended "meta" narrative kept breaking through. Similarly, AG3's narrative was evocative in inviting engagement, but it splintered somewhat in the emergence of "meta" topics.

### 6.6.4 Framing dimension E.4: Clarity of Artifacts (A.6.1)

| | High | | | | | | | Low |
|---|---|---|---|---|---|---|---|---|
| E.4. Clarity of Artifacts (A.6.1) | Hab<br>High | RG1<br>High | RST<br>High | RG2<br>Med<br>High | AG4<br>Med<br>High | AG3<br>Med<br>Low | AG1<br>Med<br>Low | AG2<br>Med<br>Low |

- Component (A) Towards the practitioner's own involvement (self in situation)
  - Element (A.6) Artifacts should be clear, expressive, and helpful (Dewey)
    - How clear are the artifacts produced/modified by the practitioner?

This dimension is related to the "finishedness" of artifacts (section 6.5.4) as well as the three "refinement" dimensions (textual, visual/spatial, and hypertextual, sections 6.5.1 through 6.5.3), but puts special emphasis on how clear the representations were during the course of the session. The dimension falls into the *aesthetics* component of the conceptual framework as a direct reflection of practitioner shaping of the artifacts.

Three of the sessions – Hab, RG1, and RST – rated High in this area. The representations in the top-ranked Hab session were very clear and expressive, given knowledge of the context and subject matter (which the participants had). For RG1, given that the intent of the exercise was for the participants to come up with their own names/descriptions for the pre-existing groups of images, there was clarity in the form of the pre-constructed map: a simple question ("In what ways has the space program been of value?") with blank answer nodes that 'contained' the groups of images (see Figure 6.30).

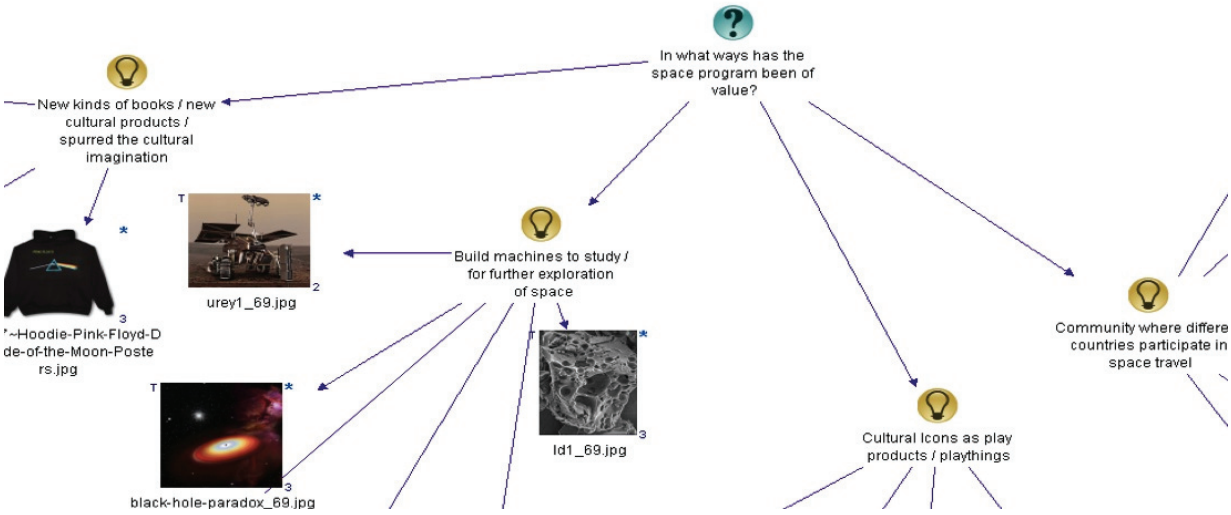



**Figure 6.30: Portion of RG1's map showing root question and image grouping nodes**

All of the RST practitioner's artifacts produced during the session were clear, though not all of the pre-prepared artifacts were. The sheer size and complexity of the pre-prepared automatically generated materials caused some confusion. At times, watching the practitioner navigate through them did not appear helpful to the participants (they would usually stop engaging at those moments).

The Medium High-rated RG2's representational artifact was very clear, though additional annotation could have been provided that would have made it more clear to a new participant what the relationships between the elements were (e.g., there was nothing in the representation to indicate that the nodes linked to the images were "memories" per se). However, given the

background knowledge given to the participants, the artifacts were well organized, succinctly worded, and clear. Similarly, AG4's representation was kept clear and coherent throughout, with some temporary dips in clarity due to clutter.

The remaining three sessions – AG3, AG1, and AG2 – were all rated Medium Low. The structure brought in by the AG3 practitioners did hold up for the most part, but it took a good deal of discussion and questioning of what was intended and how to proceed for participants to engage in the way intended by the planners. It was not so clear at first, and never quite made it all the way to perfect clarity. AG1's seed question and maps were clear enough to generate active discussion along the intended course. However, the image aspect was not followed, at least in part because it was not clear how or why the participants were to choose images that aligned with their answers to the seed question. The map contents generated during the session itself stayed clear except when the mapper fell behind, generating repair activities. Neither the lowest-ranked AG2 session's prepared map nor the additions made from time to time by the mapper contributed much clarity to the session. Participants commented afterward that they weren't able to follow the map, and turned away from it. The additions during the session were minimal in nature, though well-formed and clear as far as they went.

### 6.6.5 Framing dimension E.5: Openness and Dialogicity Pertaining to the Mediated Objects (A.5.1, A.5.2)

| High openness and dialogicity | | | High openness, lower dialogicity | Somewhat open and somewhat dialogical | High dialogicity, lower openness | | Some small potential for openness, quickly superseded; little dialogicity in the representation |
|---|---|---|---|---|---|---|---|
| Hab | AG4 | RST | RG2 | AG1 | AG3 | RG1 | AG2 |
| High | High | High | Med High | Med | Med Low | Med Low | Low |

- Component (A) Towards the practitioner's own involvement (self in situation)
  - Element (A.5) Mediated objects and other interventions should preserve openness and dialogicity (Wright & McCarthy)
    - How do the representations the practitioner constructs or modifies foster openness and dialogicity? How do they inhibit them?

This dimension examines the extent to which the representations, verbal and physical actions, and other sorts of interventions a practitioner makes, create and preserve communicative openness and a spirit of dialogue among the participants (as opposed to enshrining one point of view or a top-down/one-way mode of communication, or one that gives more weight/credence to some participants or positions than others. The dimension falls mainly into the *aesthetics* and *ethics* components of the conceptual framework. It is one of the main ways that aesthetics and ethics touch directly, since it has to do with the ways that shaping of the representation interlaces with the ways participants can and do talk.

The three High rated sessions, Hab, AG4, and RST, were all characterized by a high degree of openness and dialogicity. The Hab session's representation employed a simple question-and-answer format, and the representations that the practitioner constructed in this session appeared to foster dialogicity and openness. This was also observable in the conversational style of the meeting and the practitioner's demonstrated willingness to be guided and to make changes when requested. The

participants were able to suggest new topics and see these incorporated immediately into the representation. By following a consistent question/answer format, and by taking pains to be sure that all contributions were mapped (sometimes asking for clarification until it was clear how they could be mapped), AG4's practitioners and the representation seemed open and amenable to dialogicity. There was no discernible inhibition. Given the way the contributions were represented, more dialogue could have easily occurred if time had permitted. In the RST session, following explicitly dialogical structures such as IBIS, the representations that the practitioner constructed in this session did not appear to inhibit dialogicity and openness. This was also seen through the conversational style of the meeting and the practitioner's demonstrated willingness to be guided and to make changes when requested. Given the complexity and sometimes confusing nature of the pre-prepared science data representations, sometimes the need to decipher or navigate took time away from what otherwise might have been further dialogue, which it could be said acted as a constraint. However this was not due to the direct action of the practitioner during the session.

RG2's Medium High rating was due to high openness but lower dialogicity than the High sessions. The nature of the planned activities and the representations, with their highly structured process and pre-determined limits and outcomes, did not lend itself to dialogicity, though it could have. Certainly the participants jumped enthusiastically into discussion whenever they weren't actively brought back to the planned tasks by the facilitator. However, within the structure of the activities, participants were free to provide (or not provide) any kind of input they wanted, which constituted a high degree of openness. Since there were pre-determined kinds of contributions and outcomes, the representation could be said to foster some inhibition, but given the bounded nature of the session (15 minutes) this was not manifest in any meaningful way.

The AG1 session had a Medium rating due to the somewhat open and somewhat dialogical nature of the representations. The seed questions were appropriately open-ended, but the Question nodes added during the session were only partially so. Some were phrased as yes-or-no questions, which

are less open. These were mostly done quickly in response to the "meta" questions that were difficult to handle, but by deciding to add these questions onto each answer they pertained to, the practitioners were preserving the opportunity to deal with the meta-questions later. By not explicitly following the pull to address the meta-questions, some openness (following any conversational thread) was sacrificed.

AG3 and RG1 had Medium Low ratings, with high dialogicity but a lower degree of openness. AG3's representations, judging by the both high engagement in them until the end and the ease with which participants discussed and argued about how best to proceed, did engender a good deal of dialogicity. However, in and of themselves, since they were intended to serve a particular purpose, they were not open in the sense that they could evolve in any possible direction. RG1's representations and the practitioners' process interventions inhibited some kinds of openness, since only the defined type and expected content type of contributions were added to the representation. However, there was a great deal of open conversation, referring not only to the exercise but to in-jokes, previous events, and other extrinsic material, which was tolerated by the practitioners within the bounds of being able to move through and complete the planned steps of the exercise. The content of the labels was to be determined and supplied by the participants, and there were no constraints put on that except to keep within the thematic boundaries set by the practitioners. The labels were offered to the participants as empty labels, implying openness as to what could be placed in them. There was quite a lot of dialogue that went into the shaping of the textual labels.

Low rated AG2's sessions began with some small potential for openness, quickly superseded by events, with little dialogicity in the representation. None of the participant contributions were mapped. Highlighting the "needs" section while participants were talking about it did, however, at least acknowledge the current subject of discussion until the mapper acted to shut off the early participant contributions aimed at questioning the pre-prepared map. The mapper's verbal intervention served to inhibit the nascent discussion about how to map the "needs" section (AG2)

### 6.6.6 Framing dimension E.6: Resistance from Participants and Materials (A.7.3)

| High level of resistance from materials; almost none from participants | High level of resistance from participants, and also from material in that the practitioners could not make it amenable | High level of resistance from materials, some from participants | Some resistance from both participants and materials | Some resistance from materials, little from participants | | Low resistance from materials, slightly more from participants | Some, but not much, resistance from materials; slightly more from participants but not much |
|---|---|---|---|---|---|---|---|
| RST<br>High | AG2<br>High | AG1<br>High | AG3<br>Med | AG4<br>Med | Hab<br>Med | RG2<br>Low | RG1<br>Low |

- Component (A) Towards the practitioner's own involvement (self in situation)
  - Element (A.7) Perseverance in the face of checks and resistance (Dewey)
    - What resistance from participants, materials, etc. occurs? How does the practitioner respond in the face of these?

This dimension gives a sense of what practitioners must encounter and overcome in the course of their work. The dimension falls primarily into the *aesthetics, ethics, narrative,* and *sensemaking* components of the conceptual framework. *Aesthetics* because it is about the encounter of practitioner with representation; *ethics* in how the practitioner deals with resistance from participants; *narrative* in that often the resistance comes from trying to maintain "fit" of representation or participant action with overall framing; *sensemaking* in the encounter with resistance and figuring out what to do about it

The RST, AG2, and AG1 practitioners all faced a High degree of resistance from either participants or materials. In the RST case, there was a high level of resistance from materials (finding things, understanding confusing data, etc. but almost none from participants. The practitioner remained intrepid throughout the session even when encountering confounding events, although he did express some confusion and frustration at times. However in all cases he quickly recovered,

sometimes with some assistance from the participants, and the session returned to forward progress. For AG2, resistance was from the participants, who voiced immediate resistance to the form of part of the prepared map. There was also resistance from the materials in that the practitioners could not make the representation amenable to what was going on in the session. AG1's practitioners encountered a high level of resistance from materials, along with some from the participants in the "meta" questions (resistance to keeping to intended course). The practitioners encountered difficulty finding a way to map the repeating "is this critical thinking" question, trying both cloning and attaching the same node to multiple answers, as well as an on-the-fly creation of a separate "What is critical thinking" map. They weren't able to quickly and cleanly map inherently complex or confusing contributions from participants, that seemed to fly off in different directions, unable to keep them neatly within a single container or structure. There was also a form of resistance in not being able to remember and mentally stack up all the offered contributions – too much input coming in too fast, then trying to remember it all while performing unrelated actions.

AG3, AG4, and the Hab session all had Medium levels of resistance. For AG3 there was some resistance from both participants and materials. The density of the comparison, labeling, and tagging approach planned by the practitioners appeared to create some resistance. Participants (to some degree) resisted being pulled back to the planned exercise when the "meta" issues arose, since it felt important to them to discuss them (in fact, the discussions arose because the materials and process did not feel clear or easy, so it was necessary to question and discuss to be able to proceed). For the AG4 and Hab sessions, there was some resistance from materials but little from participants. In the AG4 session, aside from the several times where the mapper ran out of space and had to move things around then catch up, there wasn't much resistance. Similarly, the Hab practitioner encountered some resistance from the material in the sense of having to remember and find certain items in past meetings and navigating the complex body of Compendium maps.

The two Rutgers sessions both encountered Low levels of resistance. In RG2's case it was low resistance from materials, but slightly more from participants. There was some initial mild resistance from participants who were not old enough to be aware at the time of the moon landing and thus did not know how to contribute, and later the discomfort of participant P. who felt that she should 'own' the themes assigned to the memory she had contributed. RG1's practitioner encountered some, but not much, resistance from materials; slightly more from participants but not much. For material resistance, the practitioners did not know how to contain their original groupings in the same map as the one they used to gather the participant contributions. They overcame this by reading their original labels from a sheet of paper at the end of the session. The only resistance from participants was from the mild confusion as well as the tendency to joke around.

### 6.6.7 Framing dimension E.7: Addressing and Incorporating Participant Impulses and Desires (B.1.1, B.1.2)

| Directly addressed & fully incorporated | | Directly addressed but not Incorporated | | Both directly and not addressed, some incorporated and some not | Partially addressed and partially incorporated | Combination of directly, indirectly, and not addressed, partially incorporated | One point of addressing, then almost none for the rest of the session; almost no incorporating |
|---|---|---|---|---|---|---|---|
| Hab<br>High | AG4<br>High | RG1<br>Med<br>High | RG2<br>Med<br>High | AG1<br>Med | AG3<br>Med | RST<br>Med | AG2<br>Low |

- Component (B) Towards the other people involved (participants)
  - (B.1) The importance of participants' personal impulses and desires (Dewey); attention to what may be bothering or affecting participants (Schön)
    - What observable or discoverable participant impulses, desires, or other factors are operating in the situation? How does the practitioner address these?

This dimension looks at the ways that session practitioners directly addressed any expressed or discerned participant impulses or desires. The dimension falls into the *aesthetics*, *ethics*, *narrative*, and *sensemaking* components of the conceptual framework. The aesthetic dimension addresses the

practitioner's incorporation of participant impulses and desires into the representation. The ethical dimension refers to how the practitioner deals with resistance from participants, and the narrative dimension in that often the resistance comes from trying to maintain "fit" of representation or participant action with overall framing. Sensemaking here refers to the practitioner encounter with impulses and desires and figuring out what to do about them.

The Hab and AG4 practitioners exhibited a high degree of directly addressing and fully incorporating participant impulses and desires. In the Hab session, the participants appeared to share the same orientation and goals for the meeting, with more of an emphasis on the geology itself than the practitioner. The practitioner continually encouraged them to make decisions about what to include or not to include, or how far to take a given line of questioning. The chosen topic in the AG4 session seemed to elicit personal and sometimes humorous remarks and stories. Several of the contributions expressed how the participants themselves would want to benefit from the 'educational program' posited in the pre-prepared map. The practitioners integrated each statement, whether seemingly off-topic or intended as humor, into the overall map.

The two Rutgers sessions were also both rated High, but slightly lower. They both directly addressed participant impulses and desired in terms of dealing with them head-on, but did not incorporate them in the representation. In the RG1 session, participants exhibited mild confusion as well as a tendency to joke around. The practitioner addressed these with restatements of the instructions, assurances that the participants did not have to guess the practitioners' labels, and gentle process interventions to bring the proceedings back on track. The RG2 session saw enthusiastic participant desire to participate once the directions were clear to them, and a good degree of boisterousness and willingness to joke around with each other, that sometimes temporarily took over the proceedings until reined in by the facilitator. It also appeared as though some of the memories evoked became personal expressions for some of the participants, some provoked what might have become arguments, or that they felt some need to defend the 'turf' of their contributions. Within

the fifteen-minute boundary of the session, there was not much time to address the small issues that arose. The facilitators acted quickly to make decisions about process and cut off argument.

The AG1, AG3, and RST sessions had Medium levels of addressing participant impulses and desires, sometimes directly addressing and sometimes not at all, incorporated some into the representations and some not. In the AG1 session there was the recurring participant impulse to ask "meta" questions about visual and critical thinking, as well as to intervene in the shaping of the map itself by offering suggestions for how to proceed, how to link or clone, and what should be new maps. The mapper and the facilitator each attempted to respond and include as many of these as they could within the boundaries of the session and their desire to keep it at least partially on track. They asked clarifying questions, and made attempts to accommodate in some cases. In the AG3 session, several of the participants had a seemingly strong desire to make sense of the structure provided by the practitioners by discussing how it could work, and explore the implications of the structure and the exercise for "meta" topics. The main facilitator tried to accommodate these issues for the most part. One participant, E., tried several times to voice his (meta-) concerns and questions but they were not heard or addressed directly. The RST session had a number of background issues that were more of interest to the participants than to the practitioner, mostly to do with RST/Hab crew collaboration both in the current mission and in past missions. This issue came up several times, sometimes at length, in the session, usually when the practitioner was engaged in delinked activity or otherwise at a waiting point. The practitioner did not much engage in these discussions, though some of it was taken up in the observations added to the maps.

The AG2 session had a Low degree of addressing participant impulses and desires. There was one point of addressing, then almost none for the rest of the session, and almost no incorporating. Participant J2 had a strong impulse at the start of the session to make the map cohere to his mental model of how the concepts related to each other. The mapper directly thwarted this impulse. Otherwise, the observable impulses were a collective strong desire to talk about the subject matter

itself. By letting the discussion more or less happen without further intervention, the practitioners mainly let the participants talk as they wanted to but without any engagement with the representation.

## 6.7 Composite footprints from the Shaping and Framing dimensions

Recalling Figure 5.5, Figure 6.31 presents composite pictures of the qualitative dimensions discussed in this chapter. Similar to the skill and experience composites in Figure 5.5, the differences between expert and non-expert sessions, as a whole, are clear. The "footprints" for the RST and Hab sessions are much larger than those of the non-expert sessions. Note, though, that it is not the case that higher scores mean "better" for all of the dimensions. For example, points 9 and 13 on the charts correspond to "Degree of practitioner "gating" of participant input" and "Degree of expressed participant resistance, disagreement" respectively, where lower scores are generally more desirable. In most cases, however, higher is better, and thus in general a larger footprint corresponds to a higher quality practice instance. (Note: a summary legend appears in Figure 6.32; see Appendix 11.3 for a fuller explanation of the details of these charts).

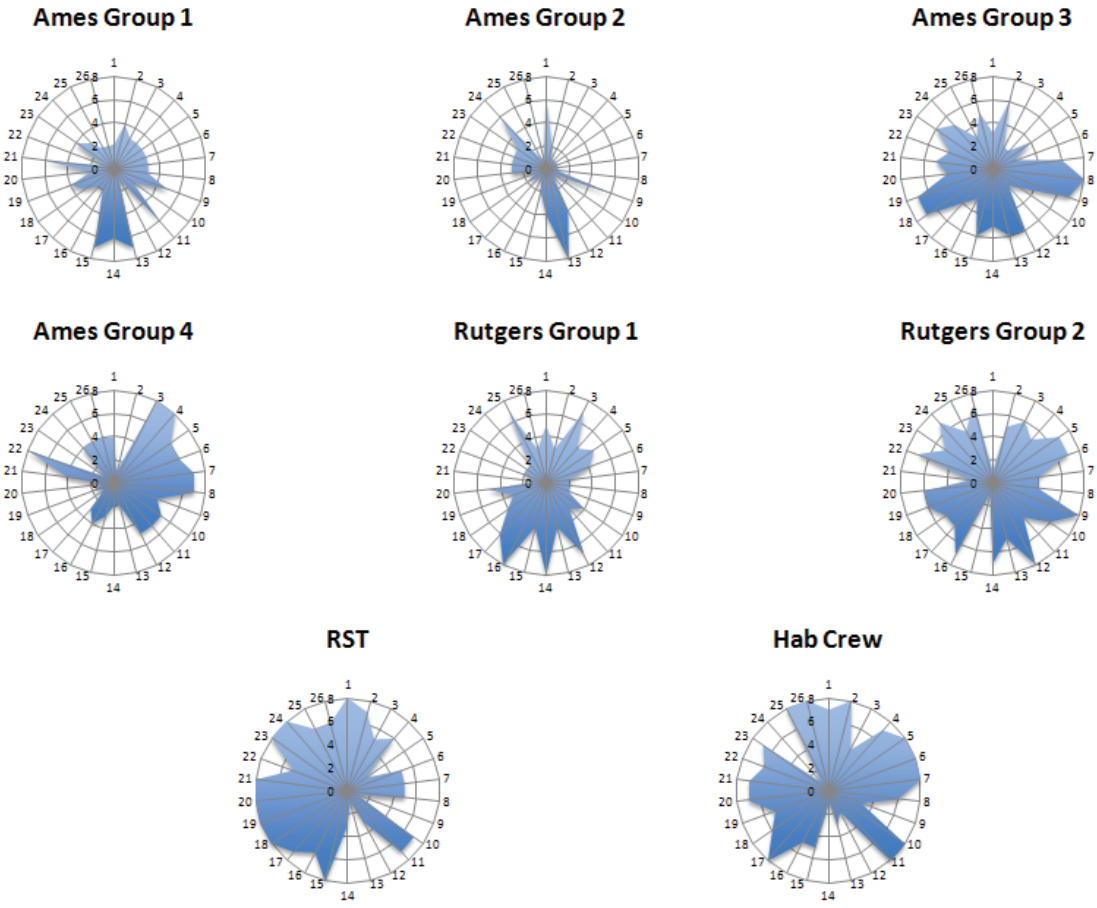



**Figure 6.31: Composite shaping and framing ratings/rankings/scores**

| | | |
|---|---|---|
| Group A: Aspects having to do with initial plan and other pre-session factors such as choice of method and approach | 1 | 3. Granularity of the pre-created structure (degree and complexity) |
| | 2 | 4. Ambitiousness of the planned approach |
| | 3 | 5. Degree of practitioner adherence to the intended method during the session |
| | 4 | 6. Participant adherence/faithfulness to the intended plan |
| Group B: Practitioner interaction with participants | 5 | 7. Density of practitioner verbal moves (frequent vs infrequent) |
| | 6 | 8. Practitioner willingness to intervene – frequency and depth of intervention |
| | 7 | 10. Degree of practitioner-asked clarifying questions to participant input |
| | 8 | 11. Degree which practitioners requested validation of changes to representation |
| | 9 | 12. Degree of practitioner "gating" of participant input |
| | 10 | 13. Degree of intervention to get participants to look at the representation |
| | 11 | 15. Degree of collaboration/co-construction between practitioners and participants |
| Group C: Characteristics of the session and discussion | 12 | 16. Multiplicity/heterogeneity of focus aspects |
| | 13 | 18. Degree of expressed participant resistance, disagreement, etc. |
| | 14 | 19. Degree of 'noise', chaos, boisterousness etc. |
| | 15 | 20. Degree of "meta" discussion |
| | 16 | 21. Where was the session on the spectrum from "discussionish" to "mapish" |
| Group D: Shaping of the representation | 17 | 22. How much attention to textual refinement of shaping |
| | 18 | 23. How much attention to visual/spatial refinement of shaping |
| | 19 | 24. How much attention to hypertextual refinement of shaping |
| | 20 | 25. Degree of 'finishedness' of the artifacts |
| | 21 | 26. Multiplicity/heterogeneity of move types/categories; diversity of move types |
| | 22 | 27. Density of practitioner shaping moves (frequent vs infrequent) |
| | 23 | 28. Complexity of the software techniques in use |
| | 24 | 29. Degree of 'exclusive'/de-linked practitioner interaction with the representation |
| Framing Analysis | 25 | Clarity of Artifacts (A.6.1) |
| | 26 | Narrative Consistency and Usefulness (A.2.2) |

**Figure 6.32: Legend for shaping/framing radar charts**

## 6.8 Chapter summary

This chapter described the "bottom-up" dimensions of participatory representational practice observed in the studied sessions, followed by the "top-down" application of constructs from the theoretical framework, looking for the ways they were instantiated in the sessions. It began with an illustrative example that showed how aspects of the Hab session were captured in the individual session analysis documents, and then how those aspects were reflected in the comparative dimensions derived from the data in the individual analyses. Following that, five categories of dimensions were discussed, comprising 35 dimensions in all. The four bottom-up categories – *Conducting, Planning, Relating,* and *Shaping* – comprised 28 of the dimensions, with the *Framing* top-down category representing the other seven. Each category was described, followed by detailed

discussions of each dimension in the category. The comparative strategy for each dimension was outlined, describing how the sessions were ranked, rated, or grouped along that dimension. Explanations of key examples from the sessions were provided, with special emphasis on the ways that practitioner choices, moves, and actions exemplified the way in which a session appeared in the dimension's comparisons. Exhibits such as transcript snippets and screenshots were provided to flesh out the explanations.

Taken as a whole, the 35 dimensions begin to constitute a taxonomy of participatory representational practice, one that will be expanded in the following chapters. They build on the more general skill and experience comparisons in the previous chapter to begin to show how practitioner actions and instances of practice can be compared along experiential dimensions. The five categories each speak directly to one of more of the research questions presented in Chapter 1 (Section 1.3). All of the categories help illuminate RQ1's concern with the interactions of specific representational situations and practitioner actions. The Relating category speaks to RQ2's concern with the kinds of obstacles, breaches, discontinuities, and anomalies that interfere with a representation's coherence, engagement, or usefulness in its dimensions that cover how a practitioner responds to participants. The Planning, Relating, and Framing categories all speak to RQ3's concern with how practitioner actions at sensemaking moments serve to restore coherence, engagement, and usefulness, since they cover actions and choices made at such moment. The Shaping category speaks directly to RQ4's concern with the specific practices involved in making the hypermedia aspects of the representation coherent, engaging, and useful.

The following chapter expands the taxonomy by focusing specifically on "grounded" (bottom-up) observations in its discussion of the sensemaking episodes in the sessions, which are categorized with special emphasis on the ethical and aesthetics aspects of practitioner responses to sensemaking triggers.

# 7 Sensemaking moment analysis

This chapter expands the taxonomy of practitioner action begun in Chapter 6, by focusing more closely on the domains of Research Questions 2 and 3 – the kinds of obstacles, breaches, discontinuities, and anomalies that interfere with a representation's coherence, engagement, or usefulness, and the ways that practitioner actions at such sensemaking moments serve to restore a session's functioning and effectiveness. This chapter presents the results of the 'sensemaking moment' analysis for the eight studied sessions.[17] As described in Chapter 4, the individual analyses for each of the sessions were analyzed in terms of their sensemaking triggers, responses, and outcomes. In terms of Chapter 2's theoretical framework, each *improvised* practitioner response to a *sensemaking* moment is characterized in both *aesthetic* and *ethical* terms.

The chapter opens with an illustrative example of how a single session (AG4) was studied with the five types of analytical tools described in Chapter 4, culminating in the way in which that session's particulars were reflected in the comparative analysis of sensemaking moments that makes up the rest of the chapter. To create the analysis, one or more triggers were identified for each analyzed moment. A trigger is an event or anomaly that provoked the practitioner into a sensemaking response. From these, nine triggers were identified and assigned to one or more of ten types (a trigger can have more than one type). The types themselves were grouped into four categories. Then, the practitioner responses to each trigger – i.e. what actions they took – were identified, as well as the results of those actions (what then occurred in the session). The responses and results were assigned types and grouped into categories according to the ethical and aesthetic dimensions of the responses. There can be more than one type per response or result, and there can also be

[17] Links to Compendium maps of the sensemaking moment analyses for each session can be found at http://people.kmi.open.ac.uk/selvin/analysis.

more than one response noted for a session. This is when there was more than one distinct practitioner response to the trigger, such as the practitioner team performing two or more distinct actions at different points in the episode, or when practitioners act differently than each other.

For example, in AG3's response, the mapper and each of the two facilitators all acted independently. It should be noted here that practitioner actions, like emotions, are always performed by an individual, even when a team of practitioners is acting in close collaboration. The "best" practitioner actions and interventions have a flavor of synchronicity, as if the different individuals are acting as one mind such that they "feel" like truly collective actions, whereas less successful multi-practitioner actions often "feel" completely uncoordinated or even at cross-purposes.

## 7.1 Illustrative example: Ames Group 4

This section presents the way that analysis of AG4's session proceeded from the raw video data, through the individual analysis artifacts, to the comparative analysis of sensemaking triggers and responses.

**Figure 7.1: AG4's mapper during their large group exercise**

### 7.1.1 Description

This section extends the introductory description of AG4 provided in section 4.3.1.

#### 7.1.1.1 Practitioner roles and planning

For AG4's large group session, one member (D.) acted as facilitator and stood in front of the room for the whole session; another (L.) acted as mapper, working on the computer running Compendium. She sat behind the U-shaped tables along with the session's participants. Introducing the session, D. laid out an intended narrative (defining 'components' of a proposed education program) in the start of the session and referred consistently to it throughout. The practitioner team intended the session to proceed as a focus group, in which participants would identify benefits for an educational program for space travel. A few seed nodes and images were prepared. The planners intended to capture ideas and questions as they emerged; they didn't plan special shaping beyond a low-key dialog mapping approach.

#### 7.1.1.2 Engagement during the session

Participants were engaged throughout the session. They appeared to be paying close attention to the map for most of the time, coming up with ideas and building on each other's contributions. For most of the session, participant contributions were quickly, competently, and comprehensively mapped.

D., the facilitator, and L., the mapper, were very engaged throughout the session and appeared to be working as a team that had worked together before (which they had not). They paid close attention to participant comments and to the shaping of the map, with the facilitator employing a variety of verbal strategies to regulate the flow of conversation as well as make sure that the mapper could catch up and capture everything. The facilitator even narrated 'side' actions that the mapper was taking (e.g. scrolling the map up), as if to explain them to the participants

#### 7.1.1.3 Shaping activities and issues

The mapping unfolded more or less organically as the session went on, in the sense that new contributions were linked to either seed nodes or earlier contributions, with the structure adjusted

on the fly to accommodate items that didn't fit cleanly (e.g. adding new questions). There were some minor issues with cleanly managing the real estate on the map, when sometimes nodes and text labels got crowded and some shifting around was necessary.

### 7.1.2 Sensemaking episode

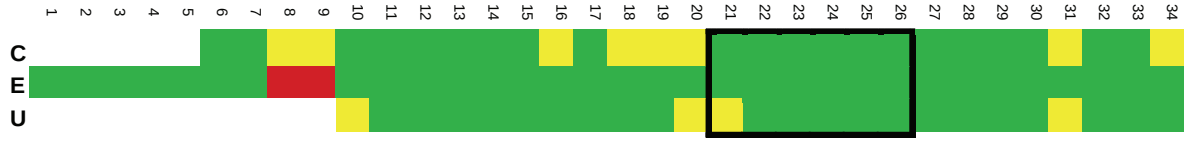



**Figure 7.2: AG4's sensemaking episode as demarcated in the CEU analysis (timeslots 21 through 26)**

The episode was 1m56s long, and took place in timeslots 21 through 26 (from 14:32 to 16:28 of the Camtasia recording). The sensemaking episode chosen started at 14:32. The mapper had just captured another participant contribution ("tell me how I could be an astronaut"), followed by the facilitator validating it with the participant.

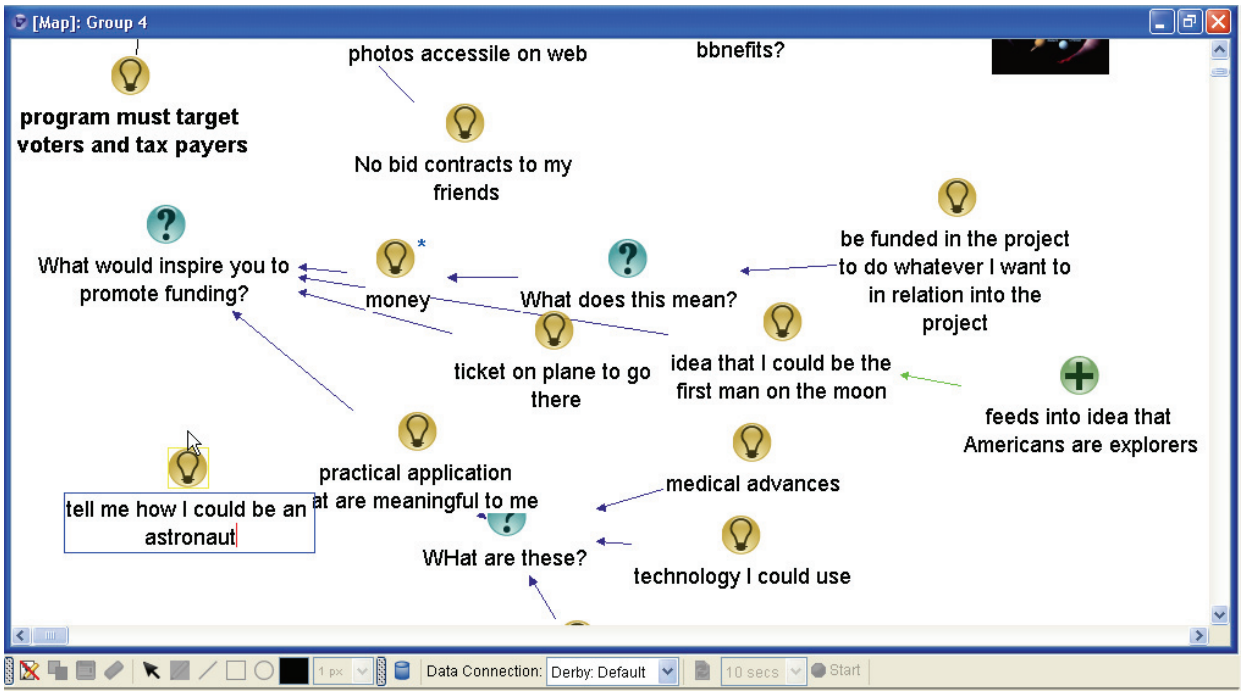



**Figure 7.3: AG4 map at the start of the sensemaking episode**

At 14:32, participant E. made the following contribution:

E: Y'know and part of that actually is, is more sort of close interaction like with the people… like I love meeting astronauts, y'know … and I still like meeting astronauts hearing about, hearing their stories and all that.

While E. was talking, mapper L. performed some cleanup of the map's layout, then positioned a new blank node for the contribution at 14:46. Facilitator D. noticed that L. might have missed some of the details, so D. provided a helpful reiteration of E.'s contribution:

D: So **close interaction with astronauts** …

E: Or with the rocket scientists.

D: Or close interaction with those involved. **Astronauts and rocket scientists, yeah**.

The last bolded point was D.'s validation as L. typed the phrase "and rocket scientists", confirming that L. had captured the point accurately.

The same participant, E., then made a fairly long speech (from 15:08 to 15:31) :

E: I think also sort of one of the underlying things I don't think it was exactly Jack's point but I think it's relevant here is, is um, people are more uh invested in something if they feel like they are co-creators? Like they're part of it? So if there are ways to involve the public like in terms of decision-making, like if you had contests where the public could actually come up with an advertisement for an example.

While he spoke, from 15:08 to 15:15, L. was doing cleanup moves in various places around the map. At 15:19 she moved the cursor around as if searching for the right place on the map to capture E.'s point, settling on a place at 15:24, which she then moved to two different places until 15:28. At 15:29 before E. stopped speaking, L. started typing "contests" but then backspaced over it as D. started rephrasing E.'s contribution:

D: So if we put a question that said how could the public become co-creators? Of the program? And then let's capture a couple of your, your ideas about that.

L. then deleted the node at 15:37 in response to D's "if we put a question" at 15:33, creating a Question node at 15:39. D. then prompted L. to create specific Idea nodes in response.

In sensemaking terms, D.'s statements here provided a "plan" for L. to follow. As L. started to create the Idea node "contest for commercial", D. said the above statement "So if we put a question that said how could the public become co-creators?" This prompted L. to abandon the Idea node (first erasing the text, then deleting the node itself) then creating the new Question "How could the public become co-creators of the project?" Those actions took from 15:39 through 15:50, while D. had already finished the above speech. Then, since the new Question's label displayed below the bottom of the visible map, D. provided another narration that guides L.'s actions:

D: Um… I think .. **just move that up a little so we can all see it** and then I think he said what was it? One was a contest for…

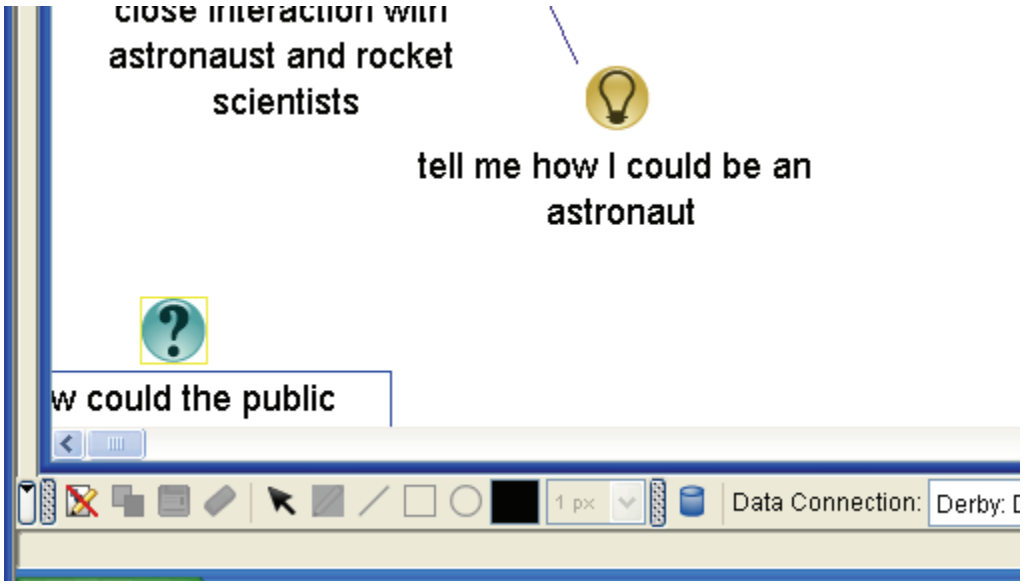



**Figure 7.4: Map when AG4 facilitator gives direction for mapper to scroll up the screen**

L. moved her cursor over to the right scrollbar to scroll the map up, while D. simultaneously bought her time by explaining to the participants what L. was doing, and prompting her to create the next set of nodes.

Other participants chimed in in response to these prompts, supplying the content for L. to create new nodes. L. herself provided one of these prompts. The sequence ended with D.'s statement "Ok great" which was an acknowledgement that L. had captured the contributions accurately (depicted in Figure 7.5).

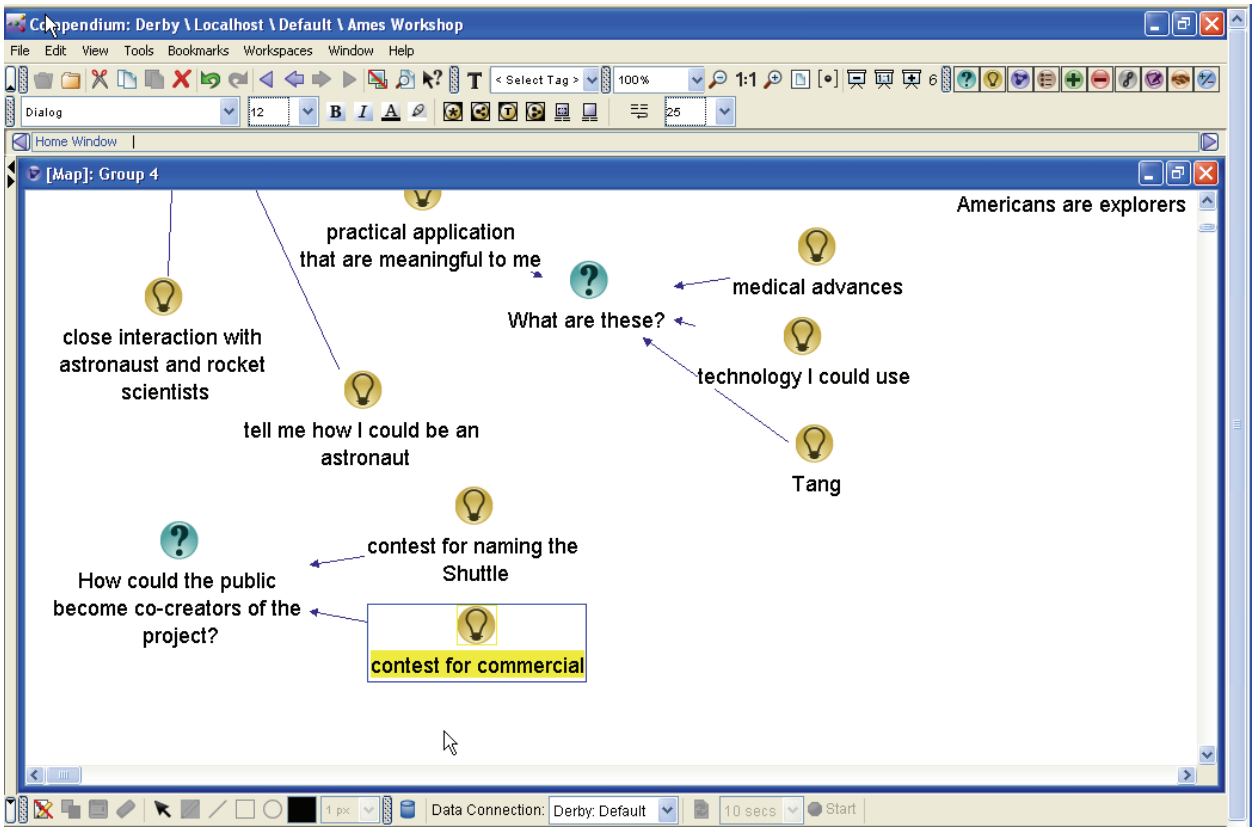



**Figure 7.5: Map at conclusion of AG4 sensemaking episode**

### 7.1.3 Tracing the sensemaking moment through the individual analysis artifacts

#### 7.1.3.1 Shaping form

The Shaping form provided the overall characterization of shaping behavior and contributing contextual factors during the AG4 session. The excerpt shown in Figure 7.6 describes the tenor of shaping during the session with specific reference to how the mapper and facilitator collaborated in what appeared to be a familiar, rehearsed manner when the mapper fell behind, as in the sensemaking episode described above.

If the intended shaping ran off the rails, why did that occur?

> There was no significant running off the rails in this session. Even when the mapper got slightly behind, the facilitator made sure that she provided (or asked again for) material that hadn't been captured. The map was slightly messy by the end, but coherent (well-formed questions, links, and answers).

Who did the shaping, for what reasons? What contributions to the shaping occurred?

> The facilitator and mapper managed the map shaping itself for the most part. Participants contributed ideas verbally throughout but did not question or suggest shaping moves (they appeared to readily accept how the shaping was done). Most participant refinements were verbal rather than map-oriented.

How were decisions about shaping made? What kinds of decisions were they? Who made them, on what basis?

How were these decisions taken up into the representation itself (if they are)?

> See previous. As mentioned above it appeared almost as if the mapper and facilitator had rehearsed and agreed how they would work together. They presented what would look to a newcomer as a nearly seamless front, with the facilitator appearing to prompt the mapper's actions (that she had in fact already started in most cases (e.g. "We're just adjusting the map so we can get a little more space here")), sometimes suggesting that something should be captured differently (e.g. as a question with hanging answers).

**Figure 7.6: Mentions of AG4's sensemaking moment within the Shaping Form**

### 7.1.3.2 CEU analysis

Figure 7.7 shows a portion of the CEU analysis for the AG4 session, depicting the sensemaking episode in timeslots 21 through 26. It describes the ways that the participants were kept engaged in the representation through the intervention of the facilitator when the mapper started to get behind, giving an appearance of fluidity to the proceedings even though the mapper was having some trouble.

| | | | | | |
|---|---|---|---|---|---|
| Starting to try to move things around to get more space; captured one thought well as a Pro | Continuing to get new contributions, fitting in to same structure | Same as previous | Adding new question, continuing to get input | Same as previous, continuing good collaboration between facil and mapper, facil supplies past content so mapper can | New contributions to new question |
| 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | 3 | 3 | 3 | 3 | 3 |
| 2 | 3 | 3 | 3 | 3 | 3 |
| 21 | 22 | 23 | 24 | 25 | 26 |
| 10:30 | 11:00 | 11:30 | 12:00 | 12:30 | 13:00 |
| | 27:47:00 | | 28:47:00 | | 29:47:00 |
| 14:20:00 | 14:50:00 | 15:20:00 | 15:50:00 | 16:20:00 | 16:50:00 |
| Same as previous but the Pro was a good way to capture | Same as previous | Same as previous | Group and prac focusing on new question/container for the incoming contributions | Same as previous | Same as previous; new question working to contain new contributions |
| Same as previous | Same as previous | Same as previous | Same as previous, but group and prac focusing on new question/container for the incoming contributions | Same as previous | Same as previous |
| Mapper started to try to address the crowding but not succeeding yet | Recovering by going down to open space | Back to fluidity | A feeling that there is a lot of good contribution coming in | Same as previous | Same as previous |
| |  | | | |  |

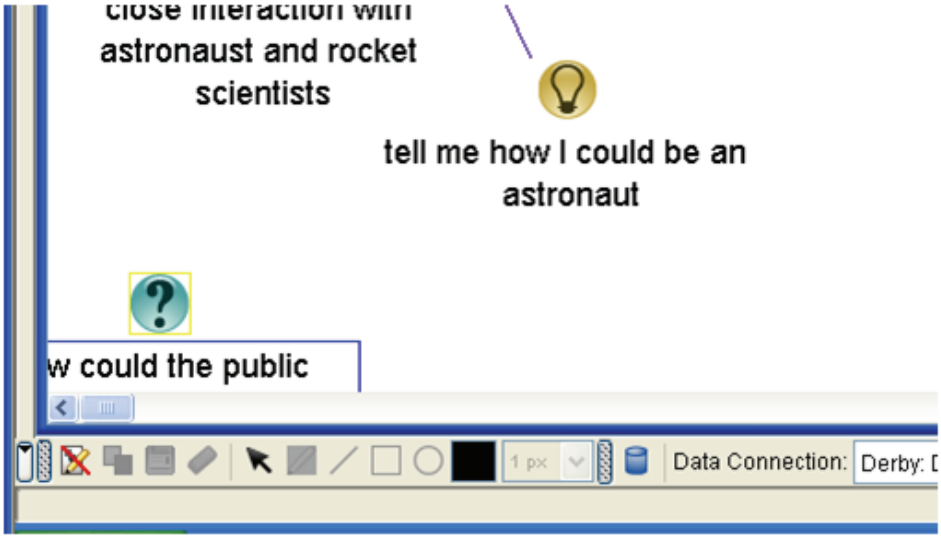
**Figure 7.7: CEU analysis for the AG4 sensemaking moment**

### 7.1.3.3 Narrative description of sensemaking moment

Figure 7.8 shows a portion of the narrative description of the sensemaking moment identified in the CEU analysis. The excerpt covers activity in timeslot 23 as the facilitator provides several kinds of direction to the mapper, enabling L. to catch up while also narrating the actions on the map for the benefit of the participants.

[C15:32] D: So if we put a question that said how could the public become co-creators? Of the program? [V28:33] And then let's capture a couple of your, your ideas about that.

D. 's statements here provide a "plan" for L. to follow. As L. starts to create the Idea "contest for commercial", D says the above statement about "So if we put a question that said how could the public become co-creators?", which prompts L to abandon the node (first erasing the text then deleting the node itself) then creating the new Question "How could the public become co-creators of the project?" That takes from C15:39 through C15:50, while D. had already finished the above speech. Then, since the new Question's label displayed below the bottom of the visible map:




L. moves over to the right scollbar to scroll the map up, while D. simultaneously buys her time, explains what L.'s doing, and prompts her to create the next nodes:

D: Um… I think… [C15:51] **just move that up a little so we can all see it** and then I think he said what was it? One was a contest for…[C15:59]

**Figure 7.8: Portion of narrative description of AG4's sensemaking moment**

### 7.1.3.4 Grid analysis

The excerpt shown in Figure 7.9 covers the same period as the example in the previous section, with more detailed coverage of the specific moves on the representation (the rightmost two columns) as well as the engagement mode (fifth column from left) of the moves made by the mapper on the representation differed from that of the facilitator. The mapper, concentrating on catching up and cleaning up the map, worked in both Indirect and Semi-Direct engagement with the participants, while the facilitator remained in Direct engagement with participants even as she was also giving direction to the mapper.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15:32:00 | 15:43:00 | | [C15:32] D: So if we put a question that said how could the public become co-creators? Of the program? [V28:33] And then let's capture a couple of your, your ideas about that. | Direct | | which prompts L to abandon the node | Verbal Query |
| 15:36:00 | 15:37:00 | | | Indirect | | Deletes the new node | Abandon |
| 15:39:00 | 15:50:00 | | | Semi-Direct |   | Creates a new Question node where the previous (deleted) node was, giving it the label "How could the public become co-creators of the project?" | Node Create-Question |
| 15:50:00 | 15:53:00 | | | Semi-Direct | | label displayed below the bottom of the visible map, L. moves over to the right lower scollbar arrow to scroll the map up, | Display Move-Making Display Amenable |
| 15:51:00 | 15:51:00 | | D: Um… I think .. [C15:51] | Direct | | D. then prompts L. to create specific Idea nodes in response, and also directs/simultaneously narrates at C15:51 as L. scrolls the map up so the question can be seen more easily on the map. D. simultaneously buys her time, explains what L.'s doing, and prompts her to create the next nodes: | Verbal Narration |
| 15:51:00 | 15:57:00 | | D: let's move that up a little so we can all see it and then I think he said what was it? One was a contest for… | Direct | | | |

**Figure 7.9: Portion of Grid analysis for AG4's sensemaking moment**

### 7.1.3.5 Framing analysis

The excerpt from the AG4 Framing analysis shown in Figure 7.10 describes how the practitioners' actions aligned with components C.1 and C.2, which both address normative aspects of connection

and communication in a session. It describes the ways that, even within the very limited fifteen minute timeframe of the session and the fact that it was the first time the facilitator and mapper had worked together, they were able to create some degree of heightened connection between the participants, discourse, and representation and to provide an inclusive atmosphere that kept participants engaged throughout the session.

| | |
|---|---|
| (C.1) Heightened degree of connection between people, setting, purpose, and medium | • *How do the practitioner's actions help create this kind of connection and integration?*<br><br>There was a high degree of isomorphism between the 'project' (intended task for the session) and the form chosen (and process employed). The participants were drawn into this and there was no resistance or confusion about what was intended. This is not the same as a truly heightened degree of connection, but within the boundaries of the timeframe people were engaged and somewhat excited, listening to each other and (to some degree) building on each other's contributions as well as on the verbal interplay between practitioners and contributions.<br><br>• *In what ways are the distinctions or boundaries between people, setting, objects, etc. made stronger or lesser?*<br><br>There was not a discernible strengthening of connection to the images or prepared map, and beyond the general engagement in the exercise, not much other bond-strengthening. People may have learned a bit about each other due to the personal nature of some of the contributions. |
| (C.2) High level and quality of communication | • *How does the practitioner elevate (or diminish) the level and quality of communication in the practice setting?*<br><br>As mentioned earlier, the practitioners used a variety of mechanism to create a feeling of invitation and inclusiveness, including request for clarification and working hard to explicitly relate even jokey contributions to the intended topic. |

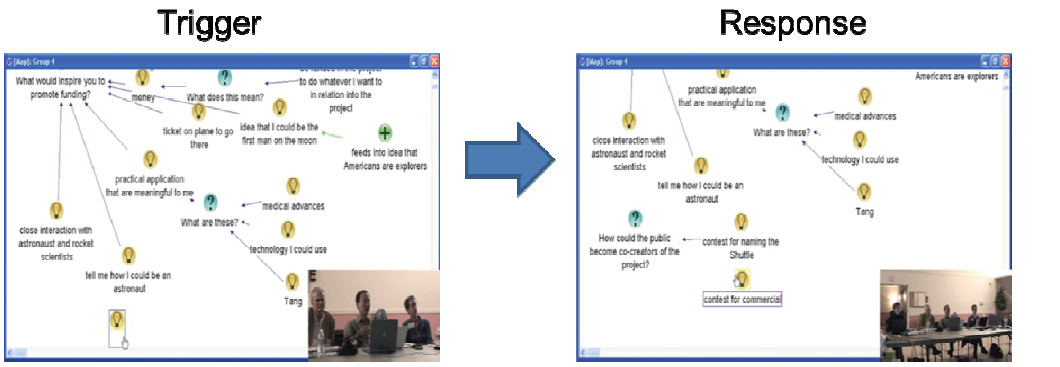
**Figure 7.10: Portion of AG4's Framing analysis**

### 7.1.4 How the individual session is reflected in the comparative analysis

This section shows how the AG4 session was reflected in the comparative analysis of practitioner sensemaking discussed later in this chapter.

### 7.1.4.1 Sensemaking trigger and response

As described in sections 7.2 through 7.6 below, sensemaking triggers and the practitioner responses to those triggers were identified in each of the studied sessions. Triggers and responses were then grouped into explanatory categories. Figure 7.11 summarizes how AG4's sensemaking moment falls into these categories. As described above, AG4's trigger came when participant E.'s contributions came too quickly for the mapper to keep up, which falls into the trigger category "Pertaining to volume or type of participant input." The facilitator's response to this was to narrate a strategy for the mapper to follow while simultaneously stopping new contributions from coming in. This response falls into the category "Holding forward progress until new strategy is in place." Since she did this to allow the mapper to catch up (rather than, for example, to assist a participant), the response falls into the ethical category of "Direct intervention for purpose of practitioner action." Aesthetically, the response falls into the category of "Creating space for remedial shaping to take place" – allowing time so that catch-up changes could be made to the map.




Pertaining to volume or type of participant input ("Too much too fast")

Facilitator: "But we had a question that says 'how can the public become co-creators?'"
Mapper creates Question node and facilitator narrates answers from previous discussion

**Response type:** Holding forward progress until new strategy is in place

**Ethical dimension:** Direct intervention for purpose of practitioner action

**Aesthetic dimension:** Creating space for remedial shaping to take place

**Figure 7.11: Summary of AG4's sensemaking moment trigger and response**

Figure 7.12 outlines AG4's trigger and response categories with red rectangles, showing how they compare to the categories derived from the other sessions (which are described later in this chapter).

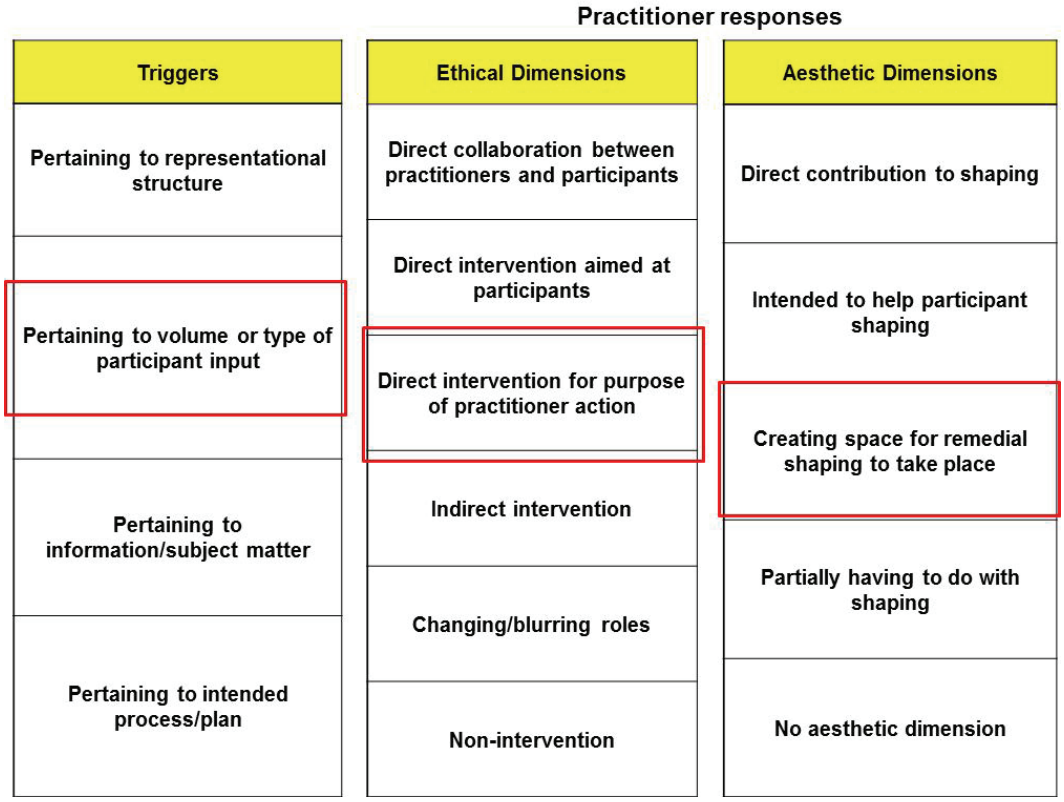



**Figure 7.12: How AG4's trigger and response map onto comparative sensemaking moment analysis**

### 7.1.5 Summary

This section traced how the sensemaking characteristics discussed in the rest of the chapter were derived from the individual analysis artifacts for one of the studied sessions (AG4).

The following sections describe the sensemaking characteristics themselves and show how all of the sessions were characterized and compared using them.

## 7.2 Sensemaking triggers in each session

As discussed in Chapter 4, sensemaking episodes were identified by selecting segments of the "heat maps" produced in the CEU analysis (see Figure 7.13). As with the CEU analysis itself, selection of the sensemaking moments to analyze was itself guided by this research's interest in highlighting the place of the visual representations in the session, as opposed to other (equally legitimate) points of focus (such as the relationships of participants to each other or to the subject matter or group process). For the purpose of this research, identifying moments where something happened that either impeded, or could have impeded, further progress on the representation itself had the highest priority.

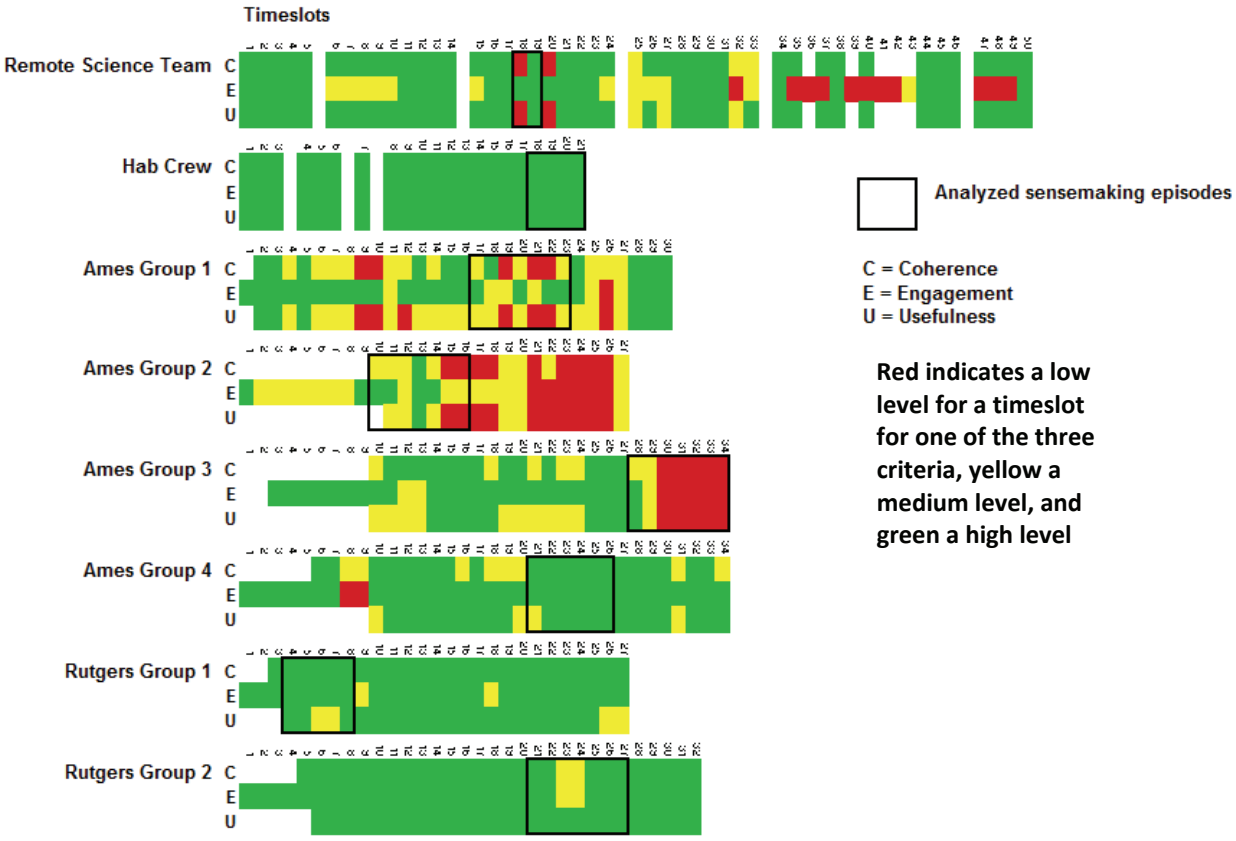



**Figure 7.13: The black outlines indicated the selected sensemaking episodes from CEU analysis**

Table 7.1 maps the specific triggers that occurred in each sensemaking episode onto the types for each trigger.

**Table 7.1: Sensemaking triggers identified in the studied sessions**

| Session | Trigger | Type of Trigger |
|---|---|---|
| **AG1** | Mapper trying to do a secondary task (creating another holding map) while participants keep going with new contributions. Participants going 'meta' and questioning why other participants kept raising "visual and critical thinking" | Too much too fast (too much coming in at once, too much going on) |
| **AG2** | Several participants objected to the way the prepared map was structured and wanted to discuss it | Incoming input doesn't fit structure; no place to put/contain current input. |
| | | Seeing things go off course; "veering off" |
| **AG3** | Participants (and one of the facilitators) go off in a meta-direction, discussion how to show argumentation about tags | Someone going off in another direction than intended with so much energy that cant' be stopped |
| | | Seeing things go off course; "veering off" |
| **AG4** | Participant E. gave a lot of verbal input while mapper was still doing small cleanups; she got behind | Too much too fast (too much coming in at once, too much going on) |
| **RG1** | Participant confusion amidst noise and joking around -- "what are we really supposed to be doing, should we guess what the practitioners intended" | Participant expresses confusion as to purpose |
| **RG2** | Participant contribution not specific or clear how/where on the map she was referring to, and in what way | Ambiguous input |
| | Participant unhappiness about the "art & literature" vs. "philosophy" tagging of "her" memory node | Participant expresses unhappiness with what other participants are doing with their ideas/input |
| **Hab** | Perception that the "first digit digit" grouping was possibly confusing, and B remembering that he had had an explanation in a previous map from another day | Current container not really working |
| | | Helpful construct or material somewhere else |
| **RST** | Discovery of missing Waypoints data | Needed information is missing |

## 7.3 Categorization of sensemaking triggers

The sensemaking trigger types identified in the previous section fall into four more general categories:

- **SMT1**: Pertaining to representational structure
- **SMT2**: Pertaining to volume or type of participant input
- **SMT3**: Pertaining to information / subject matter
- **SMT4**: Pertaining to intended process/plan

The mapping of sessions and trigger types to categories is summarized in Table 7.2 and described in more detail below.

**Table 7.2: Categorization of sensemaking triggers**

| Category | Types of Triggers | Sessions Affected |
|---|---|---|
| **SMT1:** Pertaining to representational structure | Incoming input doesn't fit structure; no place to put/contain current input | AG2 |
| | Current container (representation structure) not really working | Hab |
| **SMT2:** Pertaining to volume or type of participant input | Too much too fast (too much coming in at once, too much going on) | AG1, AG4 |
| | Ambiguous input from a participant | RG2 |
| | Someone going off in another direction than intended with so much energy that cannot be stopped (runaway freight train) | AG3 |
| **SMT3:** Pertaining to information/subject matter | Needed information is missing | RST |
| | Realization that a helpful construct or material is somewhere else | Hab |
| **SMT4:** Pertaining to intended process/plan | Participant expresses confusion as to purpose | RG1 |
| | Participant expresses unhappiness with what other participants are doing with their ideas/input | RG2 |
| | Seeing things go off course; "veering off" | AG2, AG3 |

### 7.3.1 Category SMT1: Pertaining to representational structure

| Category | Types of Triggers | Sessions Affected |
|---|---|---|
| **SMT1:** Pertaining to representational structure | Incoming input doesn't fit structure; no place to put/contain current input | AG2 |
| | Current container (representation structure) not really working | Hab |

SMT1 triggers are those pertaining to the maps' representational structure, whether from the prepared maps or those developed or expanded within a session. The category comprises two types: *incoming input doesn't fit structure* and *current container not really working*. These triggers occurred when something about the maps did not match what was happening or what was needed at some point of a session. The category falls into the *representation* and *sensemaking* components of the conceptual framework.

In the AG2 session, this occurred when the incoming participant contributions did not fit into the desired location of the prepared map. There was no place that the mapper could see to put or contain the statements and ideas coming in. Similarly, in the Hab session sensemaking moment, the practitioner realized that the "container" (a grouping question) he had created was confusing and not really helping to come up with naming conventions for the sample bags.

> 52:15
>
> M: "…I do not understand how you use these, but you do, right? It's letter letter? Is that what it is?"
>
> A: "Yeah."
>
> A: "So our sample bag would be, like, S F slash um 2 1 slash zero 1. And that would be, um…"

In the midst of this M. makes an (unprompted) grouping of the nomenclature nodes captured so far, using a Question node (see Figure 7.14):

M: "So this is letter letter right?"

A: "Yeah that's all goes there in front of it"

A: "And then …"

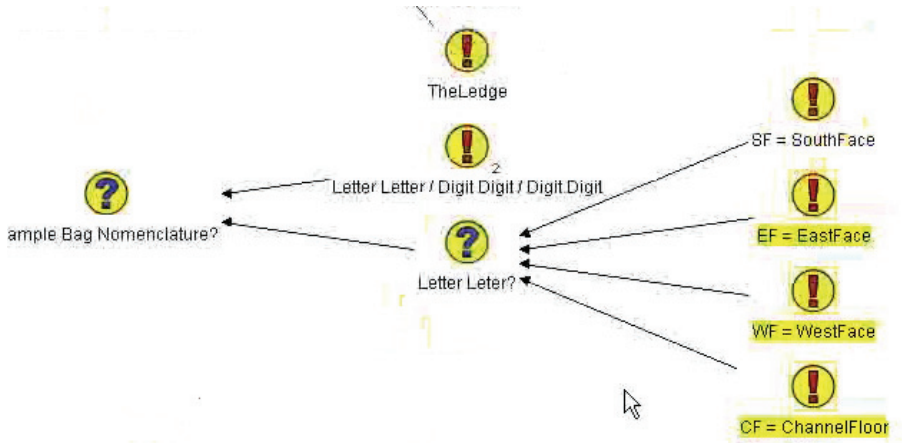



**Figure 7.14: Hab session map at 52:48, showing the grouping node that caused confusion**

M: "Allright."

But this grouping does not seem to help completely:

A: "OK. So, we know the digit digit thing. But the digit, the first digit digit…"

A: "ha… this is gonna get confusing"

M: "Well that's why I'm writing it down" (52:59)

### 7.3.2 Category SMT2: Pertaining to volume or type of participant input

| Category | Types of Triggers | Sessions Affected |
|---|---|---|
| **SMT2:** Pertaining to volume or type of participant input | Too much too fast (too much coming in at once, too much going on) | AG1, AG4 |
| | Ambiguous input from a participant | RG2 |
| | Someone going off in another direction than intended with so much energy that cannot be stopped (runaway freight train) | AG3 |

Triggers in this category have to do with either the speed or intensity of incoming participant discussion, or that there was some characteristic of the input itself that caused a disruption or breach. The category comprises three types: *too much too fast, ambiguous input from a participant*, and *runaway freight train*. The category falls into the *participants* and *sensemaking* components of the conceptual framework.

Both the AG1 and AG4 sessions experienced a *too much too fast* trigger, where more input came in than the mapper could deal with. In the AG1 session, this occurred when the mapper kept trying to perform a secondary task – creating a separate map to hold the "meta" discussion about visual vs. critical thinking, while for AG4 it was when a single participant kept a long contribution going while the mapper was trying to clean up an earlier portion of the map. The RG2 session experienced an *ambiguous input from a participant* trigger when a participant made a statement that, while intended to be a direct comment on part of the map in response to a practitioner question, did not make clear what she was referring to, precipitating confusion. The third type, *runaway freight train*, happened in the AG3 session when one of the facilitators got caught up in an idea suggested by (but not part of) the intended exercise, and started talking about with so much energy that it crowded out the intended topic and took over the proceedings.

### 7.3.3 Category SMT3: Pertaining to information / subject matter

| Category | Types of Triggers | Sessions Affected |
|---|---|---|
| **SMT3:** Pertaining to information/subject matter | Needed information is missing | RST |
| | Realization that a helpful construct or material is somewhere else | Hab |

This category contains triggers having to do with the reference information or subject matter being worked with or referred to in a session. It comprises two types: *needed information is missing*, and *realization that helpful construct or material is somewhere else*. The category falls into the *data* and *sensemaking* components of the conceptual framework.

In the RST session, a *needed information is missing* trigger occurred when both participants and practitioner realized that the Waypoints data was missing from the map they were trying to analyze. The Hab session experienced a *realization that helpful construct or material is somewhere else* trigger when they realized that the confusion they felt about the nomenclature grouping node (see section 7.3.1) could be addressed by material from a discussion they'd had about sample bag naming in a previous session.

### 7.3.4 Category SMT4: Pertaining to intended process/plan

| Category | Types of Triggers | Sessions Affected |
|---|---|---|
| **SMT4:** Pertaining to intended process/plan | Participant expresses confusion as to purpose | RG1 |
| | Participant expresses unhappiness with what other participants are doing with their ideas/input | RG2 |
| | Seeing things go off course; "veering off" | AG2, AG3 |

This category relates closely to the Planning dimensions discussed in section 6.1 above. It has to do with triggers related to deviations from, or challenges to, the intended direction of a session. It comprises four types: *participant expresses confusion as to purpose*, *participant expresses unhappiness with what other participants are doing with their ideas/input*, and *veering off*. The

category falls primarily into the *methods* and *sensemaking* components of the conceptual framework.

The RG1 session saw a *participant expresses confusion as to purpose* trigger when one of the participants expressed confusion (amidst general boisterousness) as to the practitioners' true intent for the exercise:

> Mk: I feel like I'm trying to guess what's on their mind.
>
> D: No …
>
> [Others]: No, this is what…
>
> L: You guys just come up with an answer to that question.
>
> Mi: It is actually more interesting if you come up with something entirely different.
>
> L: Um…
>
> P: But I can see why they would guess, it kind of …

The RG2 session had a trigger of the *participant expresses unhappiness with what other participants are doing with their ideas/input* type. It occurred when one of the participants tried to state that she should decide which tags to apply to one of the "memories" that she had contributed earlier. Finally, both the AG2 and AG3 sessions experienced *veering off* triggers. For AG2 this occurred when several participants objected to the way the prepared map was structured and wanted to discuss or argue about the structure. For AG3, this occurred when the participants (accompanied by one of the facilitators went off in a "meta" direction that sprang from the argument about how to represent the tags.

## 7.4 Sensemaking responses and their results in each session

The mapping of practitioner responses to sensemaking triggers to types of responses is summarized in Table 7.3. The response types are grouped into categories in terms of their aesthetic and ethical dimensions in sections 7.5 and 7.6.

The outcomes of the sensemaking responses are summarized in Table 7.4. In four of the sessions (AG1, AG4, RG1, and RG2), the actions resulted in resumption of forward movement ("back in the swing of things"), while in two of the sessions, the studied sensemaking episodes occurred at the end of the session and time ran out (with recovery in the case of the Hab session, meaning that progress could have been made if there had been more time, and without recovery in the case of AG3.

**Table 7.3: Practitioner responses to triggers**

| Session | Practitioner(s) Response to Trigger | Type of Response |
|---|---|---|
| **AG1** | The mapper was first stymied, and then a 'master' participant intervened to give her breathing room. She asked for help in what to put in -- "What's the current thing I'm trying to capture?" | Stopping forward progress and asking for help; stop-and-think to recover |
| **AG2** | Facilitator tried to discuss the issues participants were bringing up in terms of the subject matter (not the map structure); mapper pointed to the area of the map the participants were discussing and, while acknowledging their issues could be valid, directed participants to "all this stuff down here" that was the intended focus | Acknowledging diverging participant concerns, but directing focus elsewhere (in effect, 'this is what the focus should be -- this not that is what we're doing') |
| **AG3** | One of the facilitators jumps into the meta-discussion (fuels the fire), the other doesn't do anything; mapper places a "what does this mean?" node on the map | Stunned silence |
| | | Aiding and abetting (caught up in the subject matter itself instead of standing above/apart) |
| | | Making silent meta-comment |
| **AG4** | Facilitator provides a 'mini-plan' for the mapper by narrating a strategy ("if we put a Question that said…"). Mapper drops what she was doing and embraces the new plan | Holding forward progress until new strategy is in place |
| **RG1** | Clarifying comments from one of the (semi) practitioner team restates the central question and states the desired kind of response | Clarifying purpose, giving direction/expected behavior |

| Session | Practitioner(s) Response to Trigger | Type of Response |
|---|---|---|
| **RG2** | Facilitator goes up and points to screen to guide/validate what the input refers to; mapper tries to catch up in the meantime ("you keep 'em talking"); L goes over to help and they delink until they catch up. Then facilitator goes up to map again and directs participant attention there and validates | Decision to delink then strong visual validation |
| | Mapper makes instant decision about the process ("it's gotta be a group thing") but offers to make a separate tag | Process call and offer of alternate solution |
| **Hab** | Collaborative navigation to look for the remembered explanatory node, going to a couple of different maps, finding it, agreeing it was the right one, getting back to and placing into the original map, and removing the previous grouping 'first digit digit' node | Collaborative navigation to find item of interest |
| | | Negotiation/agreement on placement of an item |
| **RST** | Participants look in their own notes and discuss while practitioner delinks and looks in other maps; while discussing they take a guess that the image is at Waypoint 0; practitioner puts in a "guess" node and augments it with more information/rationale as discussion continues | Independent investigation |
| | | Meta-comment capturing interim resolution |

Note: The results shown here and in the remainder of this section are simply a report on what followed the practitioner responses in the studied sessions. They should not be understood as inherent results following these types of responses. They are also not an exhaustive catalogue of triggers, responses, and results even within the studied sessions. Rather, they represent only the triggers, responses, and results within the selected sensemaking episodes. Some of the sensemaking triggers, responses, and results recurred within the same session or in other sessions, but they are not listed or analyzed here.

**Table 7.4: Results of practitioner responses to sensemaking triggers**

| Session | Result of Response | Type of Result |
|---|---|---|
| **AG1** | Mapper was able to catch up and resume previous progress | Back in the swing of things |
| **AG2** | Participant discussion went on with no further reference to the map | Discussion and representation diverge from each other, no longer referring to representation |

| Session | Result of Response | Type of Result |
|---|---|---|
| **AG3** | Session ran out of time while still off on meta-topic | Ran out of time (without recovery) |
| **AG4** | Session continues on with new contributions | Back in the swing of things |
| **RG1** | Session gets back on track, participants finish supplying a response and practitioners move on to next item | |
| **RG2** | Participants validated that the input was captured correctly | |
| | Participant accepted the "more than one tag" solution and the way the mapper tagged the nodes | |
| **Hab** | Successful placement/agreement that the retrieved node resolves the issue | Ran out of time (with recovery) |
| **RST** | Participants acknowledge/validate the mapper's' characterization of the issue ("it *isn't* helpful so we have to go back"), then move on to the next activity | Acceptance of imperfect data, decision to move on |

## 7.5 Ethical dimensions of practitioner actions in response to triggers

This analysis provides categorizations of the types of practitioner responses to sensemaking triggers in terms of their *ethical* dimensions. This involved evaluating how the responses were related to effects on participant interests, the relationships between participants or between practitioner(s) and participants, or whether there was collaboration between participants and practitioners. In all thirteen responses were categorized. Six categories were developed, placed here in general order of more depth of intended support or enhancement of the overall participant experience vs. less (more first):

- **SME1:** Direct collaboration between practitioners and participants
- **SME2:** Direct intervention aimed at participants
- **SME3:** Direct intervention for purpose of practitioner action
- **SME4:** Indirect intervention
- **SME5:** Changing/blurring roles
- **SME6:** Non-intervention

The ethical categories are mapped to the types of responses and outcomes in Table 7.5.

**Table 7.5: Ethical dimensions of practitioner actions in response to sensemaking triggers**

| Category | Type of Response | Result |
|---|---|---|
| **SME1: Direct collaboration between practitioners and participants** | Collaborative navigation to find item of interest (Hab) | Ran out of time (with recovery) |
| | Negotiation/agreement on placement of an item (Hab) | |
| **SME2: Direct intervention aimed at participants** | Acknowledging diverging participant concerns, but directing focus elsewhere ("this is what the focus should be -- this not that is what we're doing") (AG2) | Discussion and representation diverge from each other, no longer referring to representation |
| | Clarifying purpose, giving direction/expected behavior (RG1) | Back in the swing of things |
| | Process call and offer of alternate solution (RG2) | |
| | Decision to delink then strong visual validation (RG2) | |
| **SME3: Direct intervention for purpose of practitioner action** | Holding forward progress until new strategy is in place (AG4) | |
| | Stopping forward progress and asking for help; stop-and-think to recover (AG1, AG4) | |
| **SME4: Indirect intervention** | Independent investigation (RST) | Acceptance of imperfect data, decision to move on |
| | Meta-comment capturing interim resolution (RST) | |
| | Making silent meta-comment on map (AG3) | Ran out of time (without recovery) |
| **SME5: Changing/blurring roles** | Aiding and abetting (caught up in the subject matter itself instead of standing above/apart) (AG3) | |
| **SME6: Non-intervention** | Stunned silence (AG3) | |

The scale of categories from SME1 through SME6 reflects how the practitioner actions taken at sensemaking moments (in response to triggers) have to do with the participants: talking with them, giving them instruction, stopping them from doing something, or in other ways supporting or at least

addressing their interests. The categories are listed in rough order of the degree of practitioner engagement with these participant issues in the specific situation.

The categories are described further in sections 7.5.1 through 7.5.6.

### 7.5.1 Category SME1: Direct collaboration between practitioners and participants

| Category | Type of Response | Result |
|---|---|---|
| **SME1: Direct collaboration between practitioners and participants** | Collaborative navigation to find item of interest (Hab) | Ran out of time (with recovery) |
| | Negotiation/agreement on placement of an item (Hab) | |

SME1 responses show practitioners directly engaging with participants to work together on resolving the issue, involving collaborative work on the representation (usually involving subject matter considerations as well). The category falls into the *relationship between practitioner and participants*, *ethics* (since it involves practitioner willingness and ability to collaborate), *sensemaking* and *improvisation* (because it involves improvised actions in response to the trigger) components of the conceptual framework.

Two responses from the Hab session exemplify this category. In the first, the practitioner and participants collaboratively looked for the remembered explanatory node. Talking together all the time, they navigated to a couple of different maps, eventually finding the “NOTE ON SAMPLE BAG Naming” node in an older map (see Figure 7.15), agreeing it was the right one, then getting back to and placing into the original map, removing the previous grouping “First Digit Digit” node.

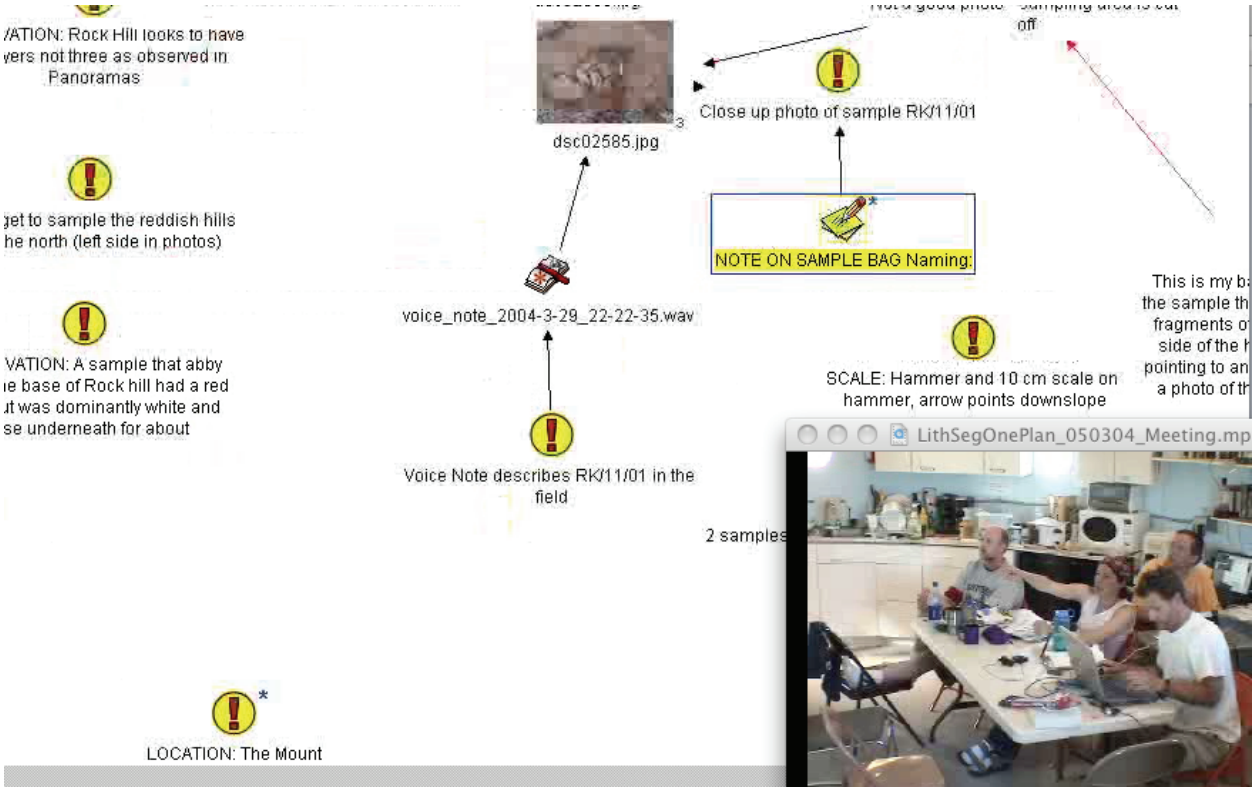



**Figure 7.15: Hab session – Finding a node to copy in a map from a previous session**

After placing the node, they examined it together, with the practitioner hovering over the node annotation indicator to see the details (see Figure 7.16):

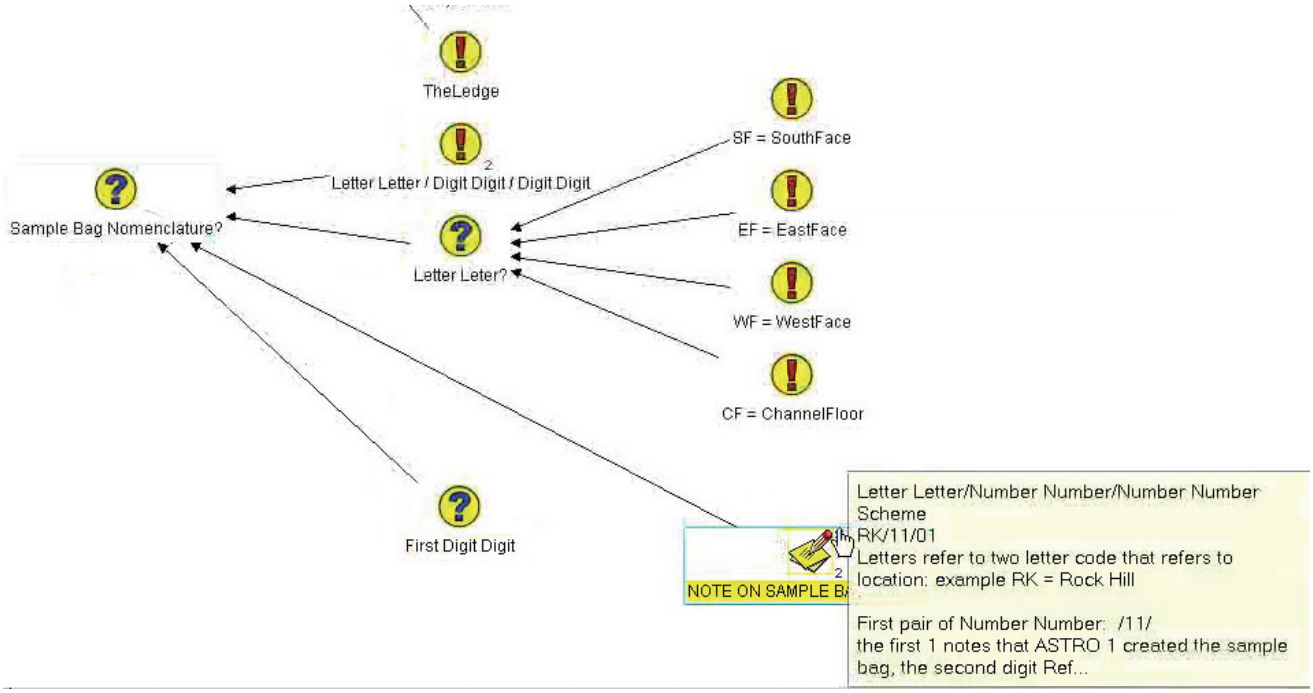



**Figure 7.16: Hab screen after pasting, linking, and hovering to reveal the annotation text**

The second example came immediately following this. Employing the kind of verbal shorthand typical of a team used to working closely together with a familiar set of tools and representations, the practitioner and participants then quickly propose, negotiate on and agree that the problematic "First Digit Digit" question node can be removed from the map to get it to its final form (see Figure 7.17):

54:31

B: "k if you look at the tag"

A: "Yeah."

B: "So..."

M: "OK"

B: "The letter refers to the location name"

M: "OK so this I can just..."

A: "Yeah."

M: "delete"

54:39

A: "So that, explains it…"

B: "Especially with the tag."

A: "that neatly…"

B: "The first pair number, the first yeah the first digit in that first pair denotes which astronaut…"

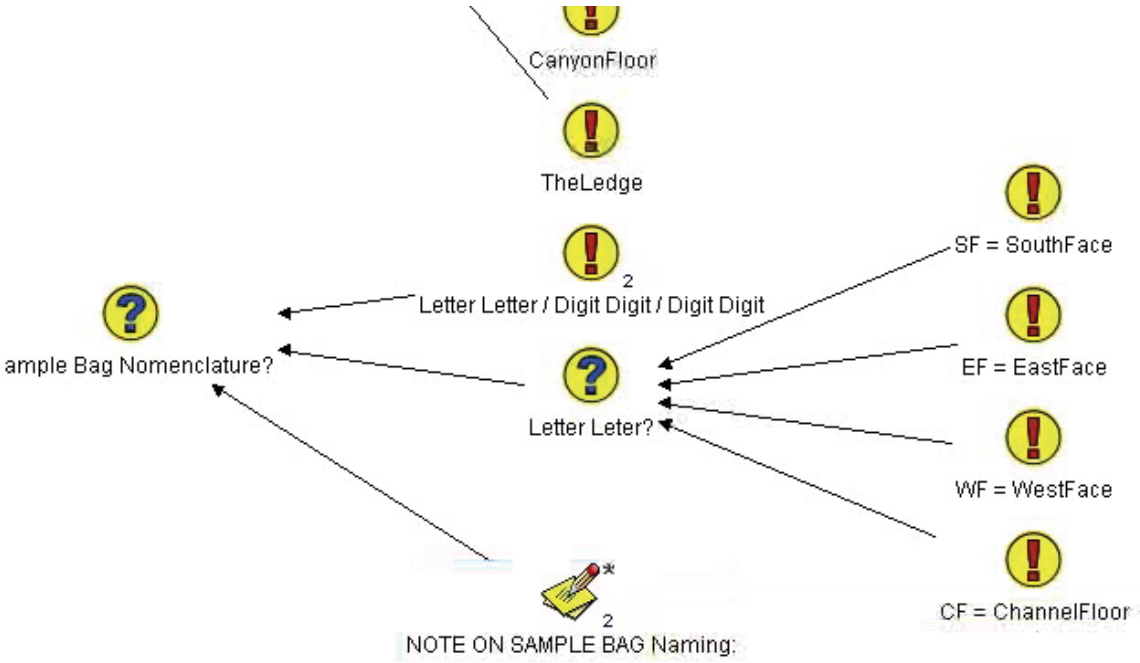



**Figure 7.17: Hab screen showing the final form of the nomenclature area of the map**

### 7.5.2 Category SME2: Direct intervention aimed at participants

| Category | Type of Response | Result |
|---|---|---|
| **SME2: Direct intervention aimed at participants** | Acknowledging diverging participant concerns, but directing focus elsewhere ("this is what the focus should be -- this not that is what we're doing") (AG2) | Discussion and representation diverge from each other, no longer referring to representation |
| | Clarifying purpose, giving direction/expected behavior (RG1) | Back in the swing of things |
| | Process call and offer of alternate solution (RG2) | |
| | Decision to delink then strong visual validation (RG2) | |

Category SME2 responses show direct engagement with participants but without active co-construction of changes to the representation. Instead, practitioners give instruction or other verbal communication to participants about what the participants should do, think, or say about the representation. There were examples from three of the studied sessions. At the sensemaking episode early in the AG2 session, the facilitator tried to discuss the issues participants were bringing up in terms of the subject matter rather than by directly referring to the maps. The mapper pointed to the area of the map the participants were discussing and, while acknowledging their issues could be valid, directed participants to "all this stuff down here" that was the intended focus rather than engaging in the type of shaping the participants were proposing. Conceptual framework components are the same as for SME1.

In the RG1 session, this type of response came when Mi., one of the “semi” practitioners (i.e., not D., the primary mapper/facilitator), in the face of some expressed confusion from participant L., provided clarifying comments restating the exercise’s central question and stating the desired kind of response:

Mi: How does that have to do with the space program adding value, though. That's the catch.

L: Oh, ok. Yeah.

Mi: This isn't just how could these three things be grouped.

L: Uh…. How the space program adds value.

There were two responses in the RG2 sensemaking episode that exemplify category SME2. In the first, the facilitator, L., goes up to the screen and points to guide participants to validate what their input refers to. While this is going on, the mapper tries to catch up ("you keep 'em talking"). As he continues to struggle with the material, L. leaves the screen and goes over to help, and they work in "de-linked" fashion until they catch up. When they finish, L. goes up to the map again and directs participant attention there to get their validation on the changes. The second example comes in the discussion that follows. One of the participants, P., expresses disagreement with the way the other participants are talking about tagging "her" memory node and asks if the "owner of the memory gets to decide" how it should be tagged. The mapper makes an instant decision about the process that partially disagrees with P.'s contention ("it's gotta be a group thing"), but offers to create a separate tag, which appears to satisfy P.'s concern.

### 7.5.3 Category SME3: Direct intervention for purpose of practitioner action

| Category | Type of Response | Result |
|---|---|---|
| **SME3: Direct intervention for purpose of practitioner action** | Holding forward progress until new strategy is in place (AG4) | Back in the swing of things |
| | Stopping forward progress and asking for help; stop-and-think to recover (AG1, AG4) | |

Category SME3 responses have practitioners actively stopping participant actions or discussion so that the practitioners themselves can perform some action, for example to clean up the

representation or catch up with “too much too fast” input. The distinction with SME2 is that the intervention is done to help a practitioner, not to directly engage with participants on the representation or subject matter.

In the AG4 session, L., the mapper, gets temporarily stymied by the rush of participant input. The facilitator (D.) then stops the proceedings and provides a verbal 'mini-plan' for L., narrating a strategy ("if we put a Question that said…"). L. drops what she had been trying to do and embraces the new plan, carrying out its steps on the map to catch up. There was a similar event in the AG1 session when the mapper, B., got behind. In this case it was a ‘master’ participant, M., that temporarily stepped into the facilitator role by intervening to give B. some breathing room. She then asked for help for what to put in the map ("What's the current thing I'm trying to capture?"):

> M.: “OK... so I would now interrupt, as a facilitator I would interrupt, because I see, um, [the mapper], struggling with keeping up… OK so I would say ‘hold that thought,’ let her just finish this for a moment… and then repeat your question so we can capture it.”
>
> B.: “Um… yeah so I did, I wasn't able to capture the stuff that went into the 'What is critical thinking' and that's where I'm behind, I'm trying to copy.”

### 7.5.4 Category SME4: Indirect intervention

| Category | Type of Response | Result |
|---|---|---|
| **SME4: Indirect intervention** | Independent investigation (RST) | Acceptance of imperfect data, decision to move on |
| | Meta-comment capturing interim resolution (RST) | |
| | Making silent meta-comment on map (AG3) | Ran out of time (without recovery) |

SME4 interventions involve working on the representation without a direct interaction with participants, often involving doing something silently in the interest of repairing or augmenting the representation. It involves a practitioner choice to perform an action on the representation without

directly involving or notifying the participants. They fall primarily into the *relationship between practitioner and representation* and *ethics* dimensions, because they involve practitioner choice to de-link from active engagement with the participants so as to focus on the representation.

The sensemaking responses in the RST session fell into this category, since the practitioner worked silently and independently (if in parallel with the participants who were discussing the same issue) to try to find the missing Waypoints data, then to add the "meta" comment to the map indicating that the participants were "guessing" that the image was taken at Waypoint 0, augmenting it with more information and rationale as the participants' discussion continues. Similarly, the "What does this mean?" node added by the AG3 mapper at the end of the session was done silently as the participants were "off" discussing the "meta" topic.

### 7.5.5 Category SME5: Changing/blurring roles

| Category | Type of Response | Result |
|---|---|---|
| **SME5: Changing/blurring roles** | Aiding and abetting (caught up in the subject matter itself instead of standing above/apart) (AG3) | Ran out of time (without recovery) |

SME5 responses involve abandoning a facilitative stance in order to step into another role, such as "becoming" a participant in the discussion. It is primarily an *ethics* issue since it involves a practitioner choice to step out of (abandon) the facilitative role. It still involves *improvisation* since there is no "script" for the action.

In the one observed example of this in the studied sensemaking episodes, one of the AG3 facilitators, J., became caught up in his own "meta" observations on the form that map was taking, choosing to "take over" the discussion with his software design ideas.

### 7.5.6 Category SME6: Non-intervention

| Category | Type of Response | Result |
|---|---|---|
| **SME6: Non-intervention** | Stunned silence (AG3) | Ran out of time (without recovery) |

Similar to SME5 in the sense that it involves a non-facilitative choice on the part of a practitioner (thus involving the *ethics* component), SME6 responses are inactions, often when a practitioner does not know how to respond to a situation. It differs from SME5 since in this case there is no improvised practitioner action.

In the AG3 session, the principal facilitator, H., responds to her co-facilitator J.'s launch into the "meta" topic with stunned silence. Although she had been active and verbal in her facilitative role throughout the session, she was not able to intervene in response to this trigger.

## 7.6 Aesthetic dimensions of practitioner actions in response to triggers

This analysis provides categorizations of the types of practitioner responses to sensemaking triggers in terms of their *aesthetic* dimensions. The principal difference between this set of categories and those of the previous section is that aesthetic aspects have primarily to do with shaping actions on the representation, while the ethical aspects have to do with the relationship of the practitioner to the participants. In all thirteen responses were categorized. Five categories were developed, placed here in general order of more depth of engagement with aesthetics vs. less (more first):

- **SMA1:** Direct contribution to shaping
- **SMA2:** Intended to help participant shaping
- **SMA3:** Creating space for remedial shaping to take place
- **SMA4:** Partially having to do with shaping
- **SMA5:** No aesthetic dimension

The most directly aesthetic responses were intrinsically concerned with operating on the representation in service of changing it, adding to it, or saying how it should be changed or added to. The less direct had either partially or not at all to do with shaping the representation, even in some cases moving the session's emphasis away from the representation. The aesthetic categories are mapped to the types of responses and outcomes in Table 7.6.

**Table 7.6: Aesthetic dimensions of practitioner actions in response to sensemaking triggers**

| Category | Type of Response | Result |
|---|---|---|
| **SMA1: Direct contribution to shaping** | Collaborative navigation to find item of interest (Hab) | Ran out of time (with recovery) |
| | Negotiation/agreement on placement of an item (Hab) | |
| | Decision to delink then strong visual validation (RG2) | Back in the swing of things |
| **SMA2: Intended to help participant shaping** | Process call and offer of alternate solution (RG2) | |
| | Clarifying purpose, giving direction/expected behavior (RG1) | |
| | Independent investigation (RST) | Acceptance of imperfect data, decision to move on |
| | Acknowledging diverging participant concerns, but directing focus elsewhere ("this is what the focus should be -- this not that is what we're doing") (AG2) | Discussion and representation diverge from each other, no longer referring to representation |
| **SMA3: Creating space for remedial shaping to take place** | Holding forward progress until new strategy is in place (AG4) | Back in the swing of things |
| | Stopping forward progress and asking for help; stop-and-think to recover (AG1, AG4) | |

| Category | Type of Response | Result |
|---|---|---|
| **SMA4: Partially having to do with shaping** | Meta-comment capturing interim resolution (RST) | Acceptance of imperfect data, decision to move on |
| | Making silent meta-comment on map (AG3) | Ran out of time (without recovery) |
| **SMA5: No aesthetic dimension** | Aiding and abetting (caught up in the subject matter itself instead of standing above/apart) (AG3) | |
| | Stunned silence (AG3) | |

The categories are described further in sections 7.6.1 through 7.6.5. Note: Since the responses below were mostly already described in the sections above, only those aspects specifically to do with aesthetics are highlighted here.

### 7.6.1 SMA1: Direct contribution to shaping

| Category | Type of Response | Result |
|---|---|---|
| **SMA1: Direct contribution to shaping** | Collaborative navigation to find item of interest (Hab) | Ran out of time (with recovery) |
| | Negotiation/agreement on placement of an item (Hab) | |
| | Decision to delink then strong visual validation (RG2) | Back in the swing of things |

SMA1 sensemaking responses focus on making significant shaping changes to the maps (textual, visual/spatial, or hypertextual), whether in collaboration with participants or not. They fall equally into the *aesthetics*, *sensemaking*, and *improvisation* components of the conceptual framework.

The Hab session's practitioner made changes with significant shaping effects during the sensemaking episode, deciding to replace a node with the older node retrieved as a result of the collaborative search with the participants and linking the retrieved node to the main Question node in that area of

the map. In the RG2 session's sensemaking episode, the mapper and facilitator work together to make a number of changes to the map then invite the participants to directly engage in validating the changes they made.

### 7.6.2 SMA2: Intended to help participant shaping

| Category | Type of Response | Result |
|---|---|---|
| **SMA2: Intended to help participant shaping** | Process call and offer of alternate solution (RG2) | Back in the swing of things |
| | Clarifying purpose, giving direction/expected behavior (RG1) | |
| | Independent investigation (RST) | Acceptance of imperfect data, decision to move on |
| | Acknowledging diverging participant concerns, but directing focus elsewhere (AG2) | Discussion and representation diverge from each other, no longer referring to representation |

SMA2 responses are concerned with potential shaping, especially in terms of how participants can contribute to the shaping, but do not in and of themselves contain active shaping. They are more to do with determining how or when to shape, but not necessarily performing the shaping itself. As with SMA1, they fall equally into the *aesthetics*, *ethics*, *sensemaking*, and *improvisation* components of the conceptual framework.

This was exemplified when the RG2 session's mapper makes the instant decision about the group process in the face of a participant objection ("it's gotta be a group thing"), but offers to make a separate textual tag that will capture how the participant wanted to tag the node. Similarly, the clarifying comments from one of the "semi" practitioners on the RG1 team restates the central question and states the desired kind of textual contribution for a node label they are looking for

from participant L. The AG2 session's mapper tries to create an invitation to a different kind of participant contribution by pointing to the area of the map the participants were discussing and, while acknowledging their issues could be valid, directing participants to "all this stuff down here" that was the intended focus. The independent searching through other maps that the RST practitioner undertook during the missing Waypoints incident was intended to help the participants (who were discussing the same issue) by finding possible content for them to agree to place in the map.

### 7.6.3 SMA3: Creating space for remedial shaping to take place

| Category | Type of Response | Result |
|---|---|---|
| **SMA3: Creating space for remedial shaping to take place** | Holding forward progress until new strategy is in place (AG4) | Back in the swing of things |
| | Stopping forward progress and asking for help; stop-and-think to recover (AG1, AG4) | |

SMA3 responses involve active shaping, but more in the service of cleaning up poorly shaped prior operations on the representation, or catching up with input, rather than an intentional new shaping activity as in SMA1. They fall equally into the *aesthetics*, *sensemaking*, and *improvisation* components of the conceptual framework, but also involve *ethics* by stopping other kinds of participant actions to allow for the remedial shaping.

AG4's facilitator (D.) does this when she interrupts a long participant contribution to create a "mini-plan" for the mapper, L., who'd been falling a bit behind, to follow. D. spells out the kind of nodes and capturing process that L. should follow, allowing her to perform the shaping and catch up:

> D.: "So if we put a question that said how could the public become co-creators? Of the program? And then let's capture a couple of your, your ideas about that."

As L. starts to create the Idea “contest for commercial,” D makes the statement above, which prompts L to abandon the node (first erasing the text then deleting the node itself) then creating the new Question “How could the public become co-creators of the project?”

In the AG1 session, an SMA3 response occurs when the 'master' participant briefly takes on a facilitator role and intervenes to give the mapper some breathing room, allowing her to ask for further help then perform a rapid series of clean-up moves on the map once she had determined her course of action.

### 7.6.4 SMA4: Partially having to do with shaping

| Category | Type of Response | Result |
|---|---|---|
| **SMA4: Partially having to do with shaping** | Meta-comment capturing interim resolution (RST) | Acceptance of imperfect data, decision to move on |
| | Making silent meta-comment on map (AG3) | Ran out of time (without recovery) |

SMA4 responses do represent changes to the representation, but more as afterthoughts or asides, done in de-linked manner. They are not significant shaping activities in and of themselves. They fall equally into the aesthetics, sensemaking, and improvisation components of the conceptual framework but are less to do with *ethics* or participant issues than SMA1, SME2, or SMA3.

The RST session’s practitioner placing of the "RST guessing" node on the map while the participants were still discussing could be taken as an invitation or prompting for the participants to augment his placeholder with a more definitive statement once they finished their deliberation on the missing Waypoint issue, but was not a major shaping intervention in the session. The AG3 session’s mapper’s placing of the silent “meta” comment ("What does this mean?") node on the map, could have been an invitation to future participant shaping, but the session ran out of time.

### 7.6.5 SMA5: No aesthetic dimension

| Category | Type of Response | Result |
|---|---|---|
| **SMA5: No aesthetic dimension** | Aiding and abetting (caught up in the subject matter itself instead of standing above/apart) (AG3) | Ran out of time (without recovery) |
| | Stunned silence (AG3) | |

SMA5 responses have no direct shaping or form-affecting results. They are either inactions or actions that have nothing directly to do with shaping the representation. As with SME6, case there is no improvised practitioner action.

When J., one of the AG3 facilitators, chose to launch into a "meta" topic, it took the session's attention away from the map and the intended exercise. H., the other facilitator, did not know what to do despite her earlier willingness to intervene, and stayed silent during the "meta" discussion until the session ran out of time.

### 7.6.6 Summary

In this section, practitioner sensemaking behavior, particularly its triggers, responses, and results, of the studied sessions were described and characterized in aesthetic and ethical terms. Table 7.7 summarizes these findings by relating the sensemaking trigger from each session to the aesthetic and ethical categorization of the practitioner responses as well as the results from those actions. By doing this, the trajectory of each studied sensemaking experience can be seen.

**Table 7.7: Sensemaking summary**

| Session | Experienced trigger(s)… | … which led to responses which in ethical terms… | … and which in aesthetic terms… | … led to the result… | …which is of type |
|---|---|---|---|---|---|
| AG1 | Pertaining to volume or type of participant input (SMT2) | Direct intervention for purpose of practitioner action (SME3) | Creating space for remedial shaping to take place (SMA3) | Mapper was able to catch up and resume previous progress | Back in the swing of things |
| AG2 | Pertaining to representational structure (SMT1) and Pertaining to intended process/plan (SMT4) | Direct intervention aimed at participants (SME2) | Intended to help participant shaping (SMA2) | Participant discussion went on with no further reference to the map | Discussion and representation diverge from each other, no longer referring to representation |

| Session | Experienced trigger(s)… | … which led to responses which in ethical terms… | … and which in aesthetic terms… | … led to the result... | ...which is of type |
|---|---|---|---|---|---|
| AG3 | Pertaining to volume or type of participant input (SMT2) and Pertaining to intended process/plan (SMT4) | Indirect intervention (SME4) and Changing/blurring roles (SME5) and Non-intervention (SME6) | Partially having to do with shaping (SMA4) and No aesthetic dimension (SMA5) | Session ran out of time while still off on meta-topic | Ran out of time (without recovery) |
| AG4 | Pertaining to volume or type of participant input (SMT2) | Direct intervention for purpose of practitioner action (SME3) | Creating space for remedial shaping to take place (SMA3) | Session continues on with new contributions | Back in the swing of things |
| RG1 | Pertaining to intended process/plan (SMT4) | Direct intervention aimed at participants (SME2) | Intended to help participant shaping (SMA2) | Session gets back on track, participants finish supplying a response and practitioners move on to next item | Back in the swing of things |
| RG2 | Pertaining to volume or type of participant input (SMT2) and Pertaining to intended process/plan (SMT4) | Direct intervention aimed at participants (SME2) | Direct contribution to shaping (SMA1) and Intended to help participant shaping (SMA2) | Participants validated that the input was captured correctly and participant accepted the "more than one tag" solution and the way the mapper tagged the nodes | Back in the swing of things |
| Hab | Pertaining to representational structure (SMT1) and Pertaining to information/subject matter (SMT3) | Direct collaboration between practitioners and participants (SME1) | Direct contribution to shaping (SMA1) | Successful placement/agreement that the retrieved node resolves the issue | Ran out of time (with recovery) |
| RST | Pertaining to information/subject matter (SMT3) | Indirect intervention (SME4) | Intended to help participant shaping (SMA2) and Partially having to do with shaping (SMA4) | Participants acknowledge/validate the mapper's' characterization of the issue, then move on to the next activity | Acceptance of imperfect data, decision to move on |

## 7.7 Using the other findings to illuminate the sensemaking data

Table 7.8 illustrates the applicability of the questionnaire and qualitative dimensions to understand practitioner sensemaking triggers, responses, and results. As an example, the findings and dimensions related to session AG1 are described in terms of how they help illuminate either the climate that gave rise to the sensemaking trigger, the ways that practitioners responded to the trigger, or the outcome of the responses (see Table 7.7 above for the summary of AG1's sensemaking episode trajectory). The table shows only a portion of the applicable dimensions with

the most direct relation to the events of the sensemaking episode itself (as opposed to the session as a whole).

**Table 7.8: Selected dimensions related to understanding the sensemaking triggers and responses for AG1**

| Finding | Applicable to | Description |
|---|---|---|
| Composite facilitation and Compendium facilitation scores | Trigger and result | AG1 practitioners had the fourth highest scores, with average scores for both measures, indicative of medium facilitation experience but low Compendium facilitation skills. The lack of Compendium facilitation skills contributed to the inability to keep up with and regulate the flow of the discussion, precipitating the sensemaking episode |
| Composite software and Compendium proficiency scores) | Trigger and result | AG1 practitioners rated themselves even lower here, with relatively low general software and Compendium proficiency scores |
| C.3. High practitioner "drive" of the session vs. high participant "drive" | Trigger | The AG1 session had high participant drive. The participants took control of the discussion itself, to the point where the mapper got behind and couldn't contain the different threads and topics in her maps |
| C.8. Degree of collaboration between multiple practitioners | Trigger | AG1's session had little direct collaboration. The roles of facilitator and mapper were strongly demarcated with little or no direct interaction. The facilitator wasn't able to help govern the flow to keep the mapper from getting behind |
| C.9. Degree of collaboration/co-construction between practitioners and participants | Response | Once the sensemaking episode begin, the AG1 session had a high degree of such collaboration due to several participants taking on "facilitator" and advisor roles to help the mapper recover from the problems |
| A.4. Degree of 'noise,' chaos, boisterousness | Trigger | The session had a medium degree of noise, to do with the arguing that ensued with the "meta" topics |
| A.5. Degree of "meta" discussion | Trigger | The session had a high degree of "meta" discussion, particularly the recurring questioning of "why is it important that we relate all these things to critical thinking," which helped to trigger the sensemaking episode |

| Finding | Applicable to | Description |
|---|---|---|
| A.6. Where was the session on the spectrum from “discussion-centric” to “map-centric” | Trigger | The session was very "discussion-centric," much of which was not integrated with the maps, which also helped contribute to the "volume of input" that the mapper couldn't keep up with |
| D.5. Density of practitioner shaping moves | Response | Much of the response to the sensemaking trigger consisted of rapid moves on the representation to fix it after getting help from the participants. The density (91.3%) was the 3rd highest of the studied sessions |
| E.1. Narrative Consistency and Usefulness<br>Evocativeness of the Narrative Framing | Trigger | The session's narrative framing was not consistent, useful, and evocative enough to withstand the unintended "meta" narrative that kept breaking through |
| E.6 Resistance From Participants and Materials | Trigger | The session had a high level of resistance from materials which led to the sensemaking episode. The mapper couldn't figure out where to and how to capture the input, as well as some from participants in the consistent bringing up of the "meta" narrative |

## 7.8 Chapter summary

This chapter described the sensemaking triggers and practitioner responses observed in the studied sessions, placing special emphasis on the aesthetic and ethical aspects of practitioner actions at sensemaking moments. Chapter 6’s “top-down” focus on the sensemaking experience was driven by the theoretical framework, in which practitioner sensemaking is seen as a particularly clear manifestation of how experiential dimensions such as improvisation, ethics, narrative and aesthetics manifest themselves in spontaneous, unplanned action. Complementing this, the approach taken in this chapter was to analyze how such action occurred in the actual studied sessions in a “bottom-up” manner. Each individual episode was analyzed to determine the sensemaking triggers, practitioner responses, and outcomes, using data from the Shaping forms, CEU analyses, narrative description of sensemaking moments, and Grid analysis, supplemented by considerations from the Framing

analysis, especially using such narrative concepts as canonicity and breach. The triggers were mapped into four abstract types. The first of the trigger types, SMT1: Pertaining to representational structure, is perhaps the least treated in the research literature – how specifically representational discontinuities can trigger practitioner sensemaking. Following the discussion of triggers, each sensemaking episode was analyzed in terms of the improvised choices and moves the practitioner made in response to the trigger. Applying explicitly ethical and aesthetic lenses to sensemaking responses in the context of participatory representational practice is one of the unique contributions of this research.

The findings developed in this chapter differ from those in the previous chapter in the following ways. The sessions were not ranked and rated along qualitative or quantitative dimensions in the ways they were in Chapter 6. This is because sensemaking triggers and responses, even though they can be grouped into abstract types, are unique and contextually driven – that is, by definition they arise in such a situated, spontaneous manner that they resist direct comparison along the kind of "higher" and "lower" lines that Chapter 6 featured. However, the imposition of the abstract types and categories provided in this chapter does provide analytical "handles" on the complex phenomenon of practitioner sensemaking. The types and categories of triggers speak most directly to Research Question 2, describing the kinds of obstacles, breaches, discontinuities, and anomalies occur that interfere with a representation's coherence, engagement, or usefulness. The types and categories of practitioner responses speak to both RQ1, providing further means of characterizing and comparing the interactions of specific representational situations and practitioner actions, and RQ3, describing how practitioner actions at sensemaking moments serve to restore coherence, engagement, and usefulness to a session. Some of the responses described also contribute to an understanding of RQ4, detailing the specific practices – improvised in these cases – involved in making the specifically *hypermedia* aspects of the representations coherent, engaging, and useful.

Even with the limited sample of eight sessions analyzed in this thesis, the preliminary taxonomy of practitioner experience begun in Chapter 6 can now be expanded to include language describing practitioner sensemaking. Future work with larger samples can expand on the types and categories presented here, focusing on the correlations between the various shaping, framing, sensemaking, skill and experience dimensions presented in this and the two previous chapters and thus expanding on the type of analysis presented in section 7.7, which shows how a combination of the categories and concepts from these findings can be applied to a specific instance of practice.

The following chapter brings the findings together and presents the preliminary taxonomy as a whole. It compares the practitioner skill and experience profiles from Chapter 5 to the dimensions arising from the qualitative analysis discussed in this and the preceding chapter. It then discusses all of the findings in preparation for the concluding chapter.

# 8 Discussion

The preceding four chapters reported the iterative development and application of a set of methods aimed at making ineffable aspects of practitioner experience analytically tangible. This chapter adds a final level of synthesis and discusses what was gained from the effort.

In chapter 5, expert and non-expert responses to the questionnaire were compared, along with session-wide comparisons of skill and experience levels, showing significant diversity in the expertise profile of the studied practitioners. Chapter 6 presented five categories of qualitative analysis, comprising 35 dimensions. The discussion of each of these dimensions showed how the studied sessions were ranked, rated, and grouped using that dimension's criteria, and rationale and examples were provided to illustrate how the sessions could be compared to each other. Following this, Chapter 7 described how eight sensemaking episodes taking place in the studied sessions were analyzed in terms of their triggers, outcomes, and the aesthetic and ethical aspects of practitioner responses to the triggers. Fifteen types of triggers and responses were identified. An example of relating the qualitative dimensions to one session's sensemaking episode trajectory was presented.

This chapter presents comparisons between the questionnaire data discussed in Chapter 5 and the qualitative findings from Chapters 6 and 7. It revisits the questionnaire data in light of comparisons with composites of the qualitative dimensions to show some potential causal relationships. It then summarizes the findings from the three chapters in preparation for the concluding chapter.

## 8.1 Relating the qualitative and questionnaire data

To assess the claim made in Chapter 5 that the levels of self-reported facilitation and software skill and experience (proficiency) would provide some level of prediction of session behavior and performance, an aggregate measure of the shaping aspects was created, named the "Shaping Index." This measure collects the rankings from thirteen of the dimensions discussed in Chapter 6 that meet the following criteria:

- A higher rank equates to "better" practitioner behavior or session quality (as opposed to some of the dimensions that either have no relationship to quality, or in which a higher rating means "worse" practitioner behavior or session quality).

- The dimension has a direct bearing on the way the practitioners performed activities related to shaping the representation and involving participants in its construction and modification

Table 8.1 lists the dimensions chosen for inclusion in the Shaping Index, which were drawn from all four of the bottom-up qualitative categories (Conducting, Planning, Relating, and Shaping). The points awarded to each session were based on their numerical rank in the comparisons for that dimension. Eight points were given for the top ranking, seven for second place, and so on.

**Table 8.1: Dimensions in the Shaping Index**

| | |
|---|---|
| A.1 | How "good"/successful was the session? |
| B.5 | Degree of practitioner adherence to the intended method during the session |
| B.6 | Participant adherence/faithfulness to the intended plan |
| C.2 | Practitioner willingness to intervene – frequency and depth of intervention |
| C.4 | Degree of practitioner-asked clarifying questions to participant input |
| C.5 | Degree which practitioners requested validation of changes to representation |
| C.7 | Degree of intervention to get participants to look at the representation |
| C.8 | Degree of collaboration between multiple practitioners (if applicable) |
| C.9 | Degree of collaboration/co-construction between practitioners and participants |
| D.1 | How much attention to textual refinement of shaping |
| D.2 | How much attention to visual/spatial refinement of shaping |
| D.3 | How much attention to hypertextual refinement of shaping |
| D.4 | Degree of 'finishedness' of the artifacts |

Table 8.2 shows the results of the comparison.

**Table 8.2: Comparing Shaping Index to session goodness and proficiency composites**

| Session | Shaping Index | Session goodness rank | Software proficiency rank | Facilitation proficiency rank |
|---|---|---|---|---|
| **Hab** | **83** | 1 | 1 | 1 |
| **RST** | **78** | 2 | 1 | 2 |
| **RG2** | **70** | 5 | 4 | 3 |
| **AG4** | **66** | 3 | 6 | 5 |
| **AG3** | **55** | 7 | 2 | 6 |
| **RG1** | **54** | 4 | 7 | 5 |
| **AG1** | **41** | 6 | 5 | 4 |
| **AG2** | **18** | 8 | 3 | 7 |

It is apparent that the Shaping Index, indicating higher quality shaping, is highly correlated with facilitation proficiency, but not with software proficiency, for the studied sessions. Some of the highest rated sessions along the software proficiency composite, such as AG3 and AG2, were among the lowest in the Shaping Index score (55 and 18) and even lower in session goodness (ranked 7th and 8th respectively). High Shaping Index scores are also fairly well correlated with session goodness, nearly as closely as with facilitation proficiency (keeping in mind the limitations of the session goodness dimension (A.1) as discussed in section 6.2.1).

As a refinement, Table 8.3 makes the same comparison but removes the facilitative dimensions of the Shaping Index to focus more tightly on the purely aesthetic aspects of shaping, the four dimensions from Category D (D.1-D.4).

**Table 8.3: Comparing purely aesthetic dimensions**

| Session | Aesthetic shaping only | Shaping Index rank | Session goodness rank | Software proficiency rank | Facilitation proficiency rank |
|---|---|---|---|---|---|
| **RST** | 31 | 2 | 2 | 1 | 2 |
| **Hab** | 26 | 1 | 1 | 1 | 1 |

| Session | Aesthetic shaping only | Shaping Index rank | Session goodness rank | Software proficiency rank | Facilitation proficiency rank |
|---|---|---|---|---|---|
| **RG2** | 22 | 3 | 5 | 4 | 3 |
| **AG3** | 22 | 5 | 7 | 2 | 6 |
| **RG1** | 18 | 6 | 4 | 7 | 5 |
| **AG1** | 11 | 7 | 6 | 5 | 4 |
| **AG4** | 7 | 4 | 3 | 6 | 5 |
| **AG2** | 7 | 8 | 8 | 3 | 7 |

With this refinement, there is a lower correlation with session goodness than when including the facilitative aspects, though still a fairly high correlation with facilitation proficiency itself (i.e., the higher scoring sessions in this comparison are still largely those that had high facilitation proficiency rankings). Software proficiency remains a less powerful predictor.

The notable exception to the close alignment of rankings between the Shaping Index and aesthetic shaping comparisons is the AG4 session, which ranked fourth in the Shaping Index but is tied for the lowest ranking in the aesthetic shaping comparison. This is largely due to the high level of facilitation proficiency on the part of the facilitator in the session (more than five years of experience and more than 50 sessions, the highest self-reported ratings), which accounted for the high scoring in the Shaping Index for its more facilitative components. The practitioners took a much less "aesthetic" approach to their representations, employing a simple discussion mapping approach and not doing much to refine the visual, hypertextual, or textual aspects of their maps.

### 8.1.1 Summary

This section presented a set of indices, composites, and comparisons that draw on both the questionnaire and the qualitative findings. While they do not amount to a generalizable claim, they are indicative of the types of correlations that might be drawn from a larger sample and more

controlled study focusing on experiential factors. The next section discusses the applicability, granularity, and predictability of the findings.

## 8.2 General comments on the findings

There are a variety of ways to classify and compare the participatory knowledge mapping sessions, and the role and performance of participatory media practitioners in those sessions. Even looking at the small sample of such sessions in this thesis, many dimensions emerge with which to draw useful distinctions. The findings in chapters 6 and 7 describe the context for participatory representational practice – how planning, relating, conducting, shaping, framing, and sensemaking all illuminate different aspects of the phenomenon.

As mentioned above, this thesis is largely an exploratory effort aimed at developing and applying methods to characterize a phenomenon, and generate concepts based on systematic analysis of the data. This section comments on interpretive considerations that became apparent during the analysis. It contains observations on the *granularity, predictability*, and *applicability* of these findings.

### 8.2.1 Granularity

Some of the findings make sense at the whole session level, while others need to be taken down to the level of the individual practitioner or even individual move or choice. In contrast to dimensions that characterize a whole session (e.g. the Conducting category), individual actions (e.g. the sensemaking responses discussed in Chapter 7) cannot really be thought of as collective items; each person responds individually even if they are collaborating, and consequently, analysis was conducted at the level of the individual move.

### 8.2.2 Predictability

Some of the findings can be explained by differences in practitioner skill and experience, such as the degree of hypertextual shaping, while some are situation-specific, such as the ethical aspects of

sensemaking responses, or the reasons for the particular density of shaping moves. The reasons for giving a session a particular ranking or rating thus need to be explained contextually. The conclusions that can be drawn from the findings in this chapter are limited in their general validity due to the small sample size and the limitations of the data sources employed (observation and questionnaires). As described in section 8.1, however, it is apparent that skill and experience variations do appear to have some causal connection to how practitioners rate along the various qualitative dimensions. At the same time, some of the findings do not correlate neatly according to skill and experience levels. For example, dimensions such as density of shaping moves (see section 6.5.5) only make sense when examined in light of very specific contextual factors. A contribution of this thesis is to show the ways in which potentially predictive factors should be moderated by situation-specific analysis to achieve useful analyses of practitioner experience and effectiveness.

### 8.2.3 Applicability

Some of the findings are useful for characterizing the practitioner experience, such as those in the Framing category, while others are useful for assessing practitioner action or effectiveness, such as the degree of collaboration and co-construction between practitioners and participants. Some can be applied to both.

A central goal of this thesis is to contribute to improving the effectiveness of participatory representational practice in particular, and communicative competence in general, by providing language, concepts, and tools with which to characterize and assess such practice. Some of the findings are most useful in providing ways to characterize a session or practitioner actions, to distinguish events or actions from each other along various dimensions.

For example, choice of method (see section 6.3.1) or the categorization of sensemaking triggers (7.3) are ways to classify aspects of a session that give context to practitioner experience or action, but are not useful, in and of themselves, to judge effectiveness or assess possible areas of improvement.

In contrast, dimensions such as visual/spatial refinement (section 6.5.2), addressing and incorporating participant impulses and desires (6.6.7), or the ethical dimensions of practitioner actions in response to sensemaking triggers (7.5), can all be used for assessment of practitioner actions in terms of effectiveness and appropriateness, with potential applications in self and peer assessment activities or practitioner education.

## 8.3 Integrating the individual and comparative analyses

This section describes how the individual and comparative analysis methods combined to contribute to the development of an overall method for analyzing participatory representational practice.

### 8.3.1 Individual analysis tools: developing an 'analytical dossier' for each session

Chapter 4 reported the iterative development of five analytical tools used to analyze the individual sessions. Together, these tools comprise both top-down (theory-driven) and bottom-up (data-driven) approaches to analyzing individual instances of practice, achieving triangulation along multiple axes. As section 4.2 described, the iterative development proceeded in three rounds. Each round applied particular analytical tools, reflected on the results, informing the tools' refinement and the development of new tools. Figure 4.1 depicted these rounds and is reproduced here (Figure 8.1) to help orient the following discussion.

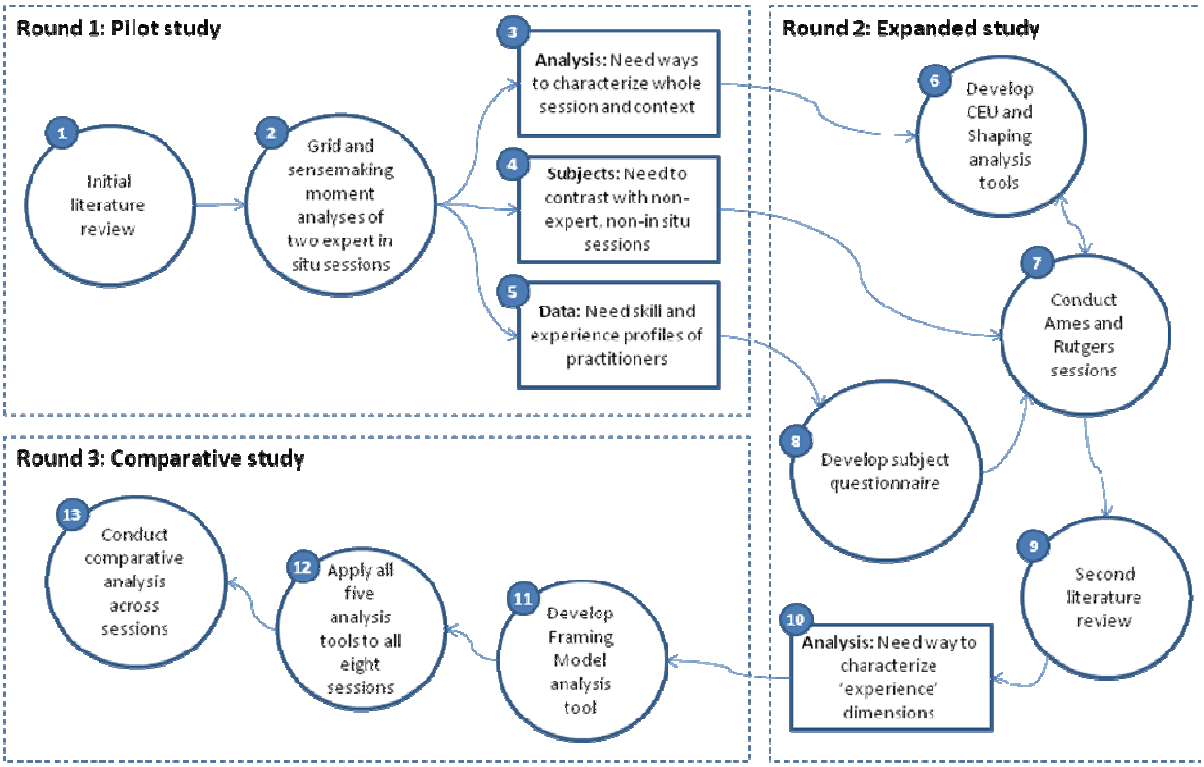



**Figure 8.1: Iterative development of analytical methods**

In the first round, bottom-up (data-driven) analysis proceeded through detailed transcript analysis of video recordings of the two Mobile Agents sessions (RST and Hab), which were followed by identification of concepts, grouping of those concepts into categories, and identifying dimensions for the categories where appropriate. This activity gave rise to the "Grid" analysis tool, which in its initial formulation was completely driven by the concepts and categories emerging from the data (step **2** in Figure 8.1). The top-down (theory-driven) analysis in the first round was limited to the decision to look for "sensemaking moments" in the recordings: moments where the practitioners encountered a block, setback, or obstacle of some sort. Following the identification of these moments, further data-driven analysis was performed by undertaking 'thick' narrative descriptions of practitioner, participant, and representational activities during the moments (also step **2**). Reflection on these analyses led to the realization that further analytical tools were needed, to provide views of sessions as whole events, augmenting the "micro" level of the Grid and Sensemaking Moment analyses (step **3**).

The second round altered the approach. Detailed transcripts were still the first step, but now the "Shaping Form" was applied to all of the studied sessions, providing template-driven characterizations of the kinds of shaping behavior and contextual factors that could be discerned in a session as a whole event (step **6**). The specific questions in the Shaping Form template were largely data-driven, coming as a result of identification of common factors and considerations observed in the first round, but they were applied to the sessions in a top-down manner (meaning they were used to guide analysis, looking at the video data through the particular lens of the questions). Similarly, the "CEU" (coherence, engagement, and usefulness) tool and 'heatmaps' visualization were developed to provide a visual characterization of a session's shaping behavior and effectiveness, by applying further general concepts observed in the sessions to each of a session's timeslots (step **6**). This activity facilitated identification of sensemaking moments and allowed them to be seen in the context of the surrounding session. This helped ground and locate the Grid and Sensemaking Moment analyses. In this round, the Grid analysis became a "top-down" tool, in the sense that it was applied in a consistent matter as a template to guide and structure inquiry. The Sensemaking Moment analyses were still free-form, data-driven, except for the theoretically driven decision to focus on such moments.

Finally, the third round added a more global level of theory-driven, top-down analysis arising from reflection and the further literature review that followed Round 2. It was in this round of review that the literature on aesthetic experience emerged as one of the clearest and most direct bodies of existing theory which illuminated the analyses as they emerged in Rounds 1 and 2 (steps **9** and **10**). In order to test this, and to add yet another level of triangulation, the "Framing" analysis tool, a completely theory-driven, top-down analysis tool was added to the mix and applied to all eight sessions (step **11**).

The result of the application of these tools to each individual session was the development of a complete analytical 'dossier' that described each session in the aesthetic, ethical, narrative,

sensemaking, and improvisational dimensions observed in the practitioners in their surrounding context. The dossiers comprised hundreds of pages of material, which in turn served as the source data for the comparative analysis that followed.

Figure 8.2 summarizes the ways each analysis technique was developed and applied. In the top row, the downward-pointing arrows indicate that two of the methods (Sensemaking Moment and Framing analysis) had their origins in top-down theoretical constructs, while the upward-pointing arrows denote that the other three emerged bottom up from the data or from reflection on the data following Round 1. In the bottom row, the upward-pointing arrow for Sensemaking Moment analysis indicates that its form and content were uniquely shaped in the analysis of each session, while the other four were applied in a top-down, uniform manner to all the sessions. The Grid analysis is a partial exception since it was developed iteratively during Round 1's analysis of the Mobile Agents sessions.

| | Narrative description of sensemaking moment | Grid | Shaping form | CEU | Framing analysis |
|---|---|---|---|---|---|
| Origin | ↓ Sensemaking theory | ↑ Emerged from micro-moment analysis in Round 1 | ↑ Emerged from reflection following Round 1 | ↑ Emerged from reflection following Round 1 | ↓ Theory-driven from Round 2 literature review |
| Application | ↑ Unique to each session | ↓ Uniform (once defined in Round 1) | ↓ Uniform | ↓ Uniform | ↓ Uniform |

**Figure 8.2: Top-down vs. bottom-up origin and application of the individual analysis methods**

### 8.3.2 Comparative analysis: synthesizing across the individual analysis dossiers

While the analytical dossiers for each individual session contained a trove of rich data, the principal point of the research (summarized in RQ1) was to enable comparisons across instances of practice in such a way as to foreground the aesthetic, ethical, narrative, sensemaking, and improvisational

dimensions, without losing or overly abstracting the contextual richness and uniqueness of each practice situation.

The comparative analysis again proceeded in both data-driven (bottom-up) and theory-driven (top-down) ways (step **13** in Figure 8.1). The first step was bottom up. All of the analytical dossiers were examined comparatively, looking for points of connection, similarity, and contrast between them. These points led to the identification of dimensions which were then grouped into thematic categories. The next step was top-down. Using the identified and categorized dimensions as guides, each session was analyzed with constant reference to particulars in the individual analysis dossiers and the source data themselves, to create and justify the ranking, rating, and grouping of the session within the dimension. This led to the shaping/framing comparisons discussed in Chapter 6.

Chapter 7's sensemaking analysis was also a combination of top-down and bottom-up, but in reverse. Constructs from the theoretical framework were applied to the dossiers in a top-down fashion, examining them for how the practitioners responded to sensemaking triggers. The practitioner responses as described in the dossiers were then analyzed in aesthetic and ethical terms as they emerged in a bottom-up fashion through the analysis, and these were grouped into categories and types.

Figure 8.3 summarizes how each of the comparative analysis methods had both data-driven and theory-driven aspects.

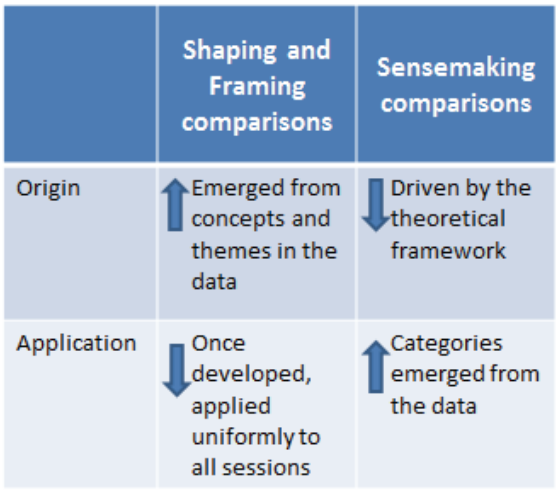



**Figure 8.3: Top-down vs. bottom-up origin and application of the comparative analyses**

### 8.3.3 A method for analyzing participatory representational practice in experiential terms

Having emerged from this iterative process and been tested against the data, the individual and comparative analysis techniques can now be called a coherent method, ready to be applied to future collections of data. Figure 8.4 brings together the artifacts, methods, and comparisons into a single diagram. It shows how the source data lies at the center of a concentric set of individual session analysis approaches, which build on each other in the manner described in Chapter 4. Concentric circles better describe the actual analysis process than a linear timeline, since each level of analysis draws from insights and references in the others. The figure then shows how Chapter 6's shaping and framing comparisons as well as Chapter 7's sensemaking comparisons lie across all of the individual session analyses, drawing as they do from each of them as needed.

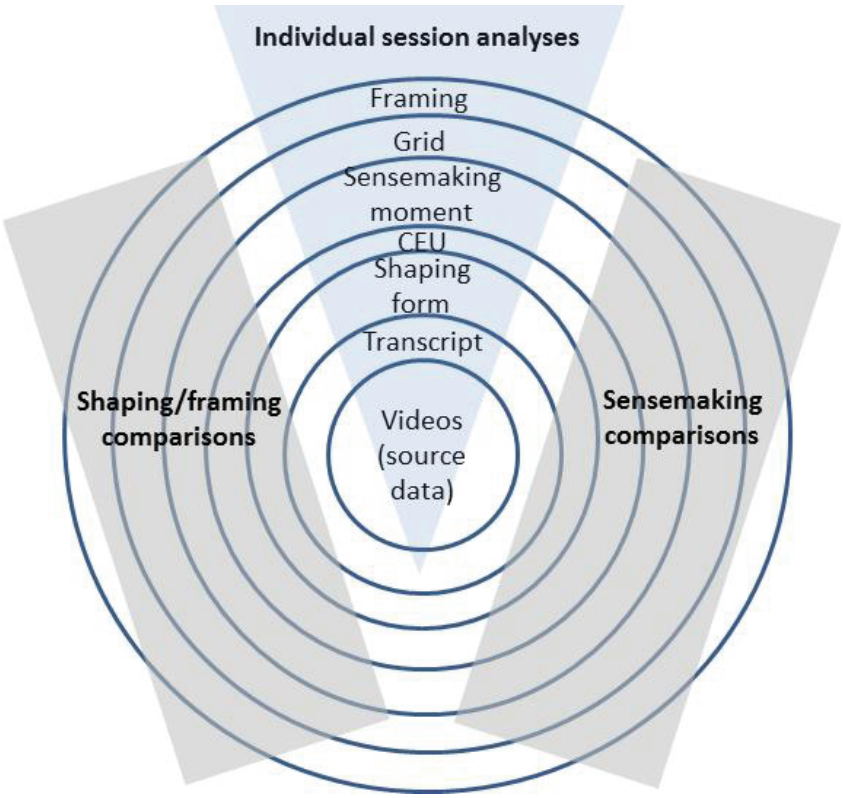



**Figure 8.4: Method for analyzing participatory representational practice in experiential terms**

Taken together, the individual and comparative analysis techniques described in this thesis form an integrated method that can be applied to diverse instances of practice, and can be used to expand and extend the preliminary taxonomy of practitioner action in participatory representational practice presented in the following section. Figure 8.5 shows how the analysis methods map on to the experiential dimensions discussed in Chapters 2 and 3. As the small x's indicate, each of the tools helps reveal each of the experiential dimensions via analysis of practice. The large bold X's indicate the special emphasis of a tool in theoretical terms. The narrative descriptions of sensemaking moments as well as CEU analyses give particular focus to events in a session that require a practitioner to engage in *sensemaking* behavior, and the ensuing *improvised* actions they take. The Shaping Form and Framing analyses encourages attention to the *aesthetic* dimensions of practitioner actions in a session, placing them in an overall *narrative* context and highlighting the *ethical* meaning and consequences of those actions in that context. Comparative analysis of data gathered through

applying all of these tools provides a nuanced portrayal of the experiential dimensions of representational practice.

| | Narrative description of sensemaking moment | Grid | Shaping form | CEU | Framing analysis |
|---|---|---|---|---|---|
| Aesthetics | x | x | X | x | X |
| Narrative | x | x | X | x | X |
| Improvisation | X | x | x | X | x |
| Sensemaking | X | x | x | X | x |
| Ethics | x | x | X | x | X |

**Figure 8.5: Relating the theoretical dimensions to the analysis tools**

## 8.4 A preliminary taxonomy of practitioner action in participatory representational practice

The previous section discussed how the techniques developed in the course of this research comprise an integrated method for analyzing practice. This section shows how the principal findings from the application of this method themselves come together into a taxonomy of concepts and categories, which can be used as both a research and diagnostic tool when seeking to understand instances of actual practice.

Figure 8.6 shows a compilation of the principal categories of shaping, framing, and sensemaking findings presented in the preceding chapters. It contains eight main categories: *Planning, Conducting, Relating, Framing, Shaping, Sensemaking Triggers, Sensemaking Response Ethics,* and *Sensemaking Response Aesthetics*. Each category contains the dimensions derived from the bottom-up and top-down analysis methods described above. Together they describe what a practitioner confronts and experiences in an instance of participatory representational practice.

| Planning |
|---|
| Choice of method |
| Emergent vs. pre-determined shaping, process |
| Granularity of pre-created structure |
| Ambitiousness of approach |
| Practitioner adherence to method |
| Participant adherence to plan |

| Conducting |
|---|
| Success of session |
| Focus aspects |
| Participant resistance, disagreement |
| Noise, chaos, boisterousness |
| Prevalence of meta-discussion |
| Discussion-centric vs. map-centric |

| Relating |
|---|
| Density of verbal moves |
| Willingness to intervene |
| Practitioner vs participant drive |
| Clarifying questions |
| Validation of changes |
| Gating of input |
| Getting participants to look at representation |
| Multi-practitioner collaboration |
| Practitioner/participant collaboration |

| Framing |
|---|
| Narrative consistency, usefulness |
| Inclusiveness of narrative framing |
| Evocativeness of narrative framing |
| Clarity of artifacts |
| Openness, dialogicity of artifacts |
| Resistance from participants, materials |
| Addressing participant impulses, desires |

| Shaping |
|---|
| Textual refinement |
| Visual/spatial refinement |
| Hypertextual refinement |
| Finishedness of artifacts |
| Density of shaping moves |
| Complexity of techniques |
| De-linked interaction with representation |

| Sensemaking Triggers |
|---|
| Representational structure |
| Participant input |
| Information, subject matter |
| Intended process, plan |

| Sensemaking Response Ethics |
|---|
| Direct collaboration |
| Intervention aimed at participants |
| Intervention for purpose of practitioner action |
| Indirect intervention |
| Changing/blurring roles |
| Non-intervention |

| Sensemaking Response Aesthetics |
|---|
| Direct contribution to shaping |
| Intended to help participant shaping |
| Creating space for remedial shaping |
| Partially having to do with shaping |
| No aesthetic dimension |

**Figure 8.6: A preliminary taxonomy of practitioner action in participatory representational practice**

While it contains several dimensions that can be found in conventional literature on facilitative practices – e.g. choice of method, success of session, participant resistance and disagreement, etc. – what distinguishes this taxonomy from the more traditional types of practitioner competence models presented in Chapter 3 (section 3.4.2) is that this taxonomy can be applied at the level of individual practitioner choice and move, framed within the broader considerations of session and context, and explicitly integrating aesthetic, ethical and other experiential considerations, in addition to more conventional aspects such as choice of technique. The taxonomy helps understand instances of practice from the "inside out" as well as the "outside in" point of view that characterizes most of the research discussed in Chapter 3. Taken together, the elements of the taxonomy provide a conceptual lens on practice that more closely recognizes the moment-to-moment grappling with

and balancing between multiple priorities and imperatives that actually characterize the work of participatory representational practitioners.

The taxonomy is presented as preliminary since it is based solely on the findings associated with the eight sessions actually studied as part of this research. As Chapters 4 and 5 argued, although this is a relatively small number of sessions, there was sufficient diversity in practitioner skill and experience as well as the settings for the studied sessions to claim some representativeness in the findings. As the following chapter will discuss, future work could expand and extend this taxonomy by applying it to broader samples and types of practices.

## 8.5 Revisiting the research questions

The findings in this thesis illuminate Chapter 1's research questions in a variety of ways.

- ***RQ1: How to characterize and compare the interactions of specific representational situations and practitioner actions?***

  The thesis has described three main types of comparative dimension (skill and experience comparisons based on the questionnaire data, the Shaping and Framing dimensions, and the sensemaking comparisons), and showed how the sessions and practitioners can be related to one another across multiple dimensions. By explicitly addressing experiential criteria, it showed how characterizations of practitioner action can move beyond tool, method, and outcome measures (while still incorporating those factors). Integrating data from the questionnaire comparisons, particularly the composite skill and experience measures, reveals a variety of indices that distinguish practitioner expertise levels, and help to explain the flexibility and resilience with which a practitioner responds to challenges and anomalies. The Shaping and Framing dimensions illustrate 35 examples of comparisons in which each of the eight studied sessions was arrayed from situational, aesthetic, ethical, and other perspectives. The sensemaking analysis shows how sessions can be characterized and compared in terms of fifteen types of triggers, responses, and results. Taken together, the

methods used to generate the comparisons, and the taxonomy that emerged, serve as a starting point for future research on practice as well as for methods for reflective practitioner development, a theme that will be taken up in the final chapter.

- ***RQ2**: What kinds of obstacles, breaches, discontinuities, and anomalies occur that interfere with a representation's coherence, engagement, or usefulness?*

  The Framing analysis in section 6.6 showed how narrative considerations such as the interactions of intended plan, practitioner and participant actions, and session events highlight the evocative and inclusiveness of a session's narrative framing, and helps explain perceived causality and breaches that occur. The analysis described how narrative framing helps to characterize both sensemaking triggers and improvisational responses. Many of the Shaping dimensions, as well, refer to the kinds of obstacles (e.g., noise, disagreement, resistance, going off topic) which practitioners may face in the course of a session. The sensemaking analysis presented in Chapter 7 catalogs four types of sensemaking triggers and eleven categories of practitioner responses observed in the studied sessions. As with all of the findings presented in this thesis, these analyses are not exhaustive of all possible practitioner sensemaking triggers and responses. They begin to surface the kinds of distinctions that can be made with close analysis of practitioner action and experience.

- ***RQ3: How do practitioner actions at sensemaking moments serve to restore coherence, engagement, and usefulness?***

  Chapter 7 documented the range in effectiveness with which the studied practitioners combined verbal and representational moves to overcome their sensemaking challenges. These ranged from "stunned silence" and inaction in the face of participant digressions, to masterful demonstrations of simultaneous complex repairs, hypertextual shaping, and verbal interactions under pressure. The sensemaking analysis in Chapter 7, as well as the qualitative dimensions in Chapter 6, serve to show the variety of practitioner actions in the face of sensemaking triggers and the ways that their efficacy can be understood in context.

The actions can be understood in both aesthetic and ethical terms. The qualitative dimensions, especially those in the Framing, Shaping, and Sensemaking Response aesthetic categories, presented a variety of ways to characterize and compare practitioner efforts to create, maintain, or restore coherence, engagement, and usefulness. The dimensions, classifications and variety surfaced in the thesis, while intriguing, are still preliminary and should be regarded as descriptive and generative at this point. As will be discussed in Chapter 9, future work should extend the observations to broader samples, leading to more predictive and generalizable theory.

- ***RQ4**: **What are the specific practices involved in making the hypermedia aspects of the representation coherent, engaging, and useful?***

  Section 6.5 described the Shaping dimensions derived from the qualitative analysis. These dimensions target the specifically hypertextual aspects of the shaping practitioner performed (sometimes in collaboration with participants) on the visual representations. It examined the way practitioners employed textual, visual/spatial, and hypertextual refinements to the hypermedia representations, as well as the degree to which they were able to give "finish" to the aesthetic aspects of the representations, and how ambitious and complex the technical manipulations they undertook were. Throughout Chapters 6 and 7, the thesis examined the ways these shaping efforts intertwined with the larger context and events, moving the sessions either closer or farther away from a greater degree of CEU. As Chapter 3 discussed, there is a dearth of literature examining the practitioner experience in creating hypermedia artifacts, especially participatory ones. This thesis represents a significant contribution in this area.

## 8.6 Chapter summary

This chapter discussed how the findings and research methods presented in the earlier chapters came together with the concepts from the theoretical framework and literature review. It first

presented the "Shaping Index" as a way of bringing together the quantitative and qualitative findings from the thesis. It next presented general comments on the findings, discussing their granularity, predictability, and applicability. Following that, it described how the analysis techniques from Chapter 4 represent an integrated method, and how the findings from Chapters 5 through 7 come together in a preliminary taxonomy of practitioner experience in participatory representational practice. Finally, it related the discussion of methods and findings to Chapter 1's research questions.

This, and the previous three chapters, presented the findings from the qualitative and questionnaire data, emphasizing how sessions and practitioner actions can be characterized, compared, and understood in context. Taken together, the four chapters illuminate practitioner interactions with materials, technologies, artifacts, methods, participants, and each other, as well as the "in use" skills and experience and what role they play in a session. They show how the core ideas in the conceptual framework come to life in eight actual sessions conducted in different settings by a diverse set of practitioners.

The concluding chapter presents the contributions, limitations, implications, and directions for future work.

# 9 Conclusion

This chapter summarises the contributions that this work brings to the study of professional practice in general, and participatory representational practice in particular. It describes the limitations of the approach taken, and concludes with discussions of implications and future work.

## 9.1 Contributions

This thesis makes a number of contributions to the fields reviewed in Chapters 1, 2 and 3. The primary contributions, detailed in Chapter 8's synthesis, can be summarised as follows:

- Offers analytical tools for individual session analysis and comparative analysis, comprising new ways to direct analytical attention and starting points for reflection and discussion
- Provides a preliminary taxonomy with which to characterize and compare instances of representational practice
- Describes the types of sensemaking moments that practitioners encounter
- Highlights the specific role of a hypermedia technology
- Contributes to reflective methods for practitioner and practice development

Unlike other approaches, this thesis devotes special attention to the interactions between, on the one hand, a practitioner's attempts to create a coherent, engaging, and useful representational artifact, and on the other, the servicing of and responsiveness to the people the practitioner is working with and for. As such, this research bridges the "making" and the interactional dimensions of professional practice. Unlike many approaches to facilitation and mediation research, it pays direct attention to the specific role of a technology in the process of artifactual shaping (in this case, the hypertextual shaping performed by knowledge mapping practitioners, in combination with the textual and visual aspects of shaping).

As the following sections detail, the contributions have both methodological and theoretical dimensions.

### 9.1.1 Methodological contributions

A key methodological commitment was to the development of observational and analytical techniques tailored to the demands of the research setting and theoretical goals. Thus a chief contribution of this thesis is the development of a set of analytical tools aimed at making participatory representational practitioner actions and choices visible and amenable for discussion, analysis, and reflection. This contribution is important for both research and practice. The tools evolved through several rounds of iteration as described in Chapter 4, and were tested against eight instances of actual practice as described in Chapters 4 through 8:

- The *Shaping form* provides a template of questions highlighting the representational character of the whole session to delineate the intended and actual shaping that took place
- *CEU analysis* directs analytical attention at the ways practitioners addressed the coherence of the representation, the engagement of participants with the representation, and the usefulness of the representation for a session's goals in short timeslots, visualizing these in "heat maps" that provide an overview of sensemaking behavior during a session
- *Grid analysis* provides a finer-grained method to locate individual practitioner verbal and representational moves, as well as participant verbal responses, on a matrix of thematic aspects that examine the moves according to type, degree of participant engagement, practitioner mode of response and engagement with participants, and objects of practitioner focus
- *Framing analysis* provides a set of theoretically derived normative questions that characterize practitioner actions in aesthetic, ethical, and experiential terms

These analytical tools were designed to be "agnostic" to any particular participatory representational practice and tool while being sensitive to the situated work of the practitioner. The

intention is that practitioners and researchers will be able to incorporate the tools developed in this research into further studies of practice and evaluation methodologies in diverse contexts and situations (Bardzwell, 2010).

The tools constitute a method for studying practitioner experience from multiple perspectives, in such a way that all three elements of the triangle prescribed by Udsen & Jørgensen (2005) are incorporated: *setting*, *representational artifact* (the “design material”), and *practitioner actions*. The value of the kinds of analytical tools applied in this thesis is characterized by Small as "metaphorically creating a third dimension and offering a perspective from which to view the continuum" between the aesthetic and efferent poles of practice. Such analytical artifacts, as "viewing instruments," create a "common vantage point ... for evidence to be included and shared in a peer or joint assessment dialogue" (2009: 260). As recommended by Shaw (2010), the findings described the precursors to specific sensemaking moments (“triggers”) and the outcomes of the improvised practitioner actions taken at those moments (Wardale, 2008), characterizing them in both ethical and aesthetic terms.

### 9.1.2 Theoretical contributions

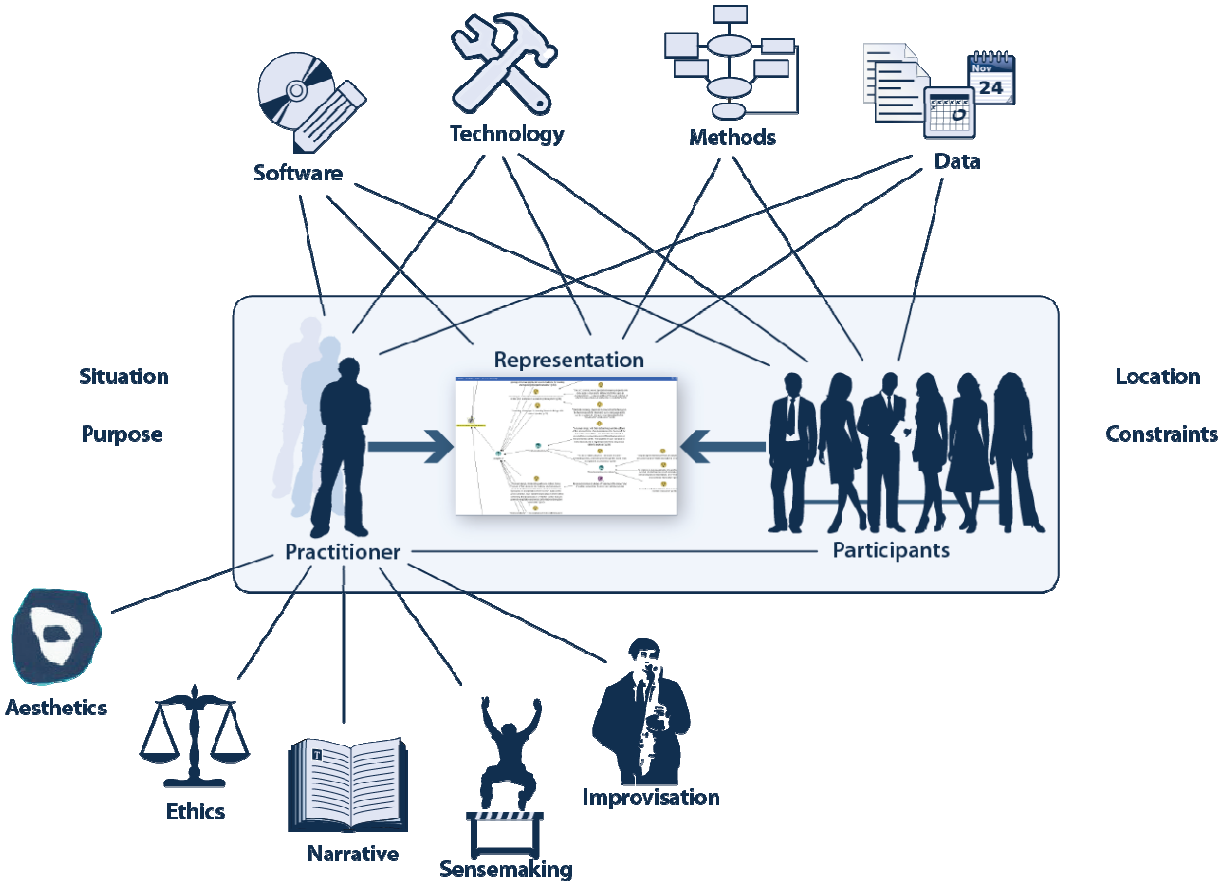



**Figure 9.1: Revisiting the framework for understanding participatory representational practice**

A chief contribution of this thesis is in applying explicitly aesthetic and experiential criteria to the work of participatory representational practice, especially focusing on the use of a particular software-based medium, contributing to descriptive and generative theory in this area (Rogers, 2004). This has resonances for the five major areas of related research discussed in Chapter 3.

#### 9.1.2.1 Computing research

The thesis foregrounds the ways that practitioners exhibit empathy and responsiveness to participants even in the heat and pressure of sessions, managing (in some cases) to perform complex representational, technical, and facilitative actions even when faced with anomalies and disruptions. The Framing model described in Chapters 2 and 4 and applied in Chapter 6 represents one form of an aesthetics-based ideal model called for by Laurel (1986) and Tractinsky (1997). It specifies

normative criteria for participatory representational practice and facilitates comparison of practice instances with that model. By examining the work of people performing the relatively mundane task of creating hypermedia knowledge maps in meetings (as opposed to more rarefied endeavors, such as hypertext fiction), it extends the concept of "aesthetic experience" into a "work-a-day" realm, making the aesthetic, ethical, improvisational, and narrative dimensions of practitioner actions visible and amenable to analysis, comparison, and discussion. By providing instantiations of these concepts in hundreds of studied moves, it contributes to lifting discussions of aesthetics from the realm of "subjectivism," so that "subjective judgment is qualified and generalized through theory and through … critical discussions in a professional community" (Bertelsen & Pold, 2004: 31).

This thesis makes one form of "articulation work" visible and amenable to analysis, illuminating the strategies, dimensions, and challenges encountered by practitioners bridging between users and hypermedia technology across diverse instances and styles. It provides a set of case studies for how participatory hypermedia artifacts come to be built, on the level of actual practice. This contributes to an understanding of what is currently left largely tacit in hypermedia practice, making it more explicit and tangible. This contributes to classic hypertext issues such as improving groups' ability to capture and formalize design rationale and related knowledge management concepts (Conklin et al., 2001). By focusing on the individual moves practitioners make, and painting a holistic picture of the nuances of such moves in the dimensions of interest, this research may help open up the conception of what kinds of moves (and tools) are possible (Aakhus, 2003), so that expert use of the tools can become more integrated into well-understood practices.

#### 9.1.2.2 Practitioner studies and reflective practice

This research brings computing case studies and technology-use mediation to many of the constructs explored in section 3.2. In the realm of sensemaking research, this thesis contributes to the understanding of the "process and behavioral strategies and tactics" of participatory representational practitioners encountering anomalies in the course of practice, and their ways of

"gap-defining and gap-bridging" (Dervin, 1992: 65-66). The emphasis on the aesthetic dimensions of such actions is a particular contribution of the research. The thesis provides both case study and theoretical support for looking at the importance of fine-grained representational actions, and presents numerous examples of the significance of "small moves" in the context of sessions.

#### 9.1.2.3 Participatory design

This research contributes accounts of a practice close to PD, placing the concerns, dilemmas, and experiential aspects of practitioners in the foreground. It examines analogous practices to PD facilitation at the move-by-move level, providing close analysis of the interactions of participants and practitioners with visual representations. The considerations and dimensions identified can contribute to development of reflective and experiential approaches to PD facilitation as a professional practice. By examining the situated web of relationships between context, participants, tools, subject matter, and so on in each session, the findings contribute to understandings of the ethical dimensions of practitioner choices, looking at how a general stance of responsibility to participants and stakeholders plays out in individual choices and moves in the heat of a session. Applying the *Framing* considerations aids in discerning the practitioners' "values in action" (Friedman, 1996), locating practitioner actions within a normative framework. These considerations also help reveal manifestations of practitioner empathy, paying special attention to the ways the practitioners are responsive to others in the studied sessions, and examining practitioner communication (both verbal and via the representations) in the way it does or does not aid mutual understanding. The research contributes to studies of facilitative coherence by describing how practitioners shape representations, as well as their verbal interventions, in ways that achieve meaningfulness and value.

#### 9.1.2.4 Facilitation and mediation

A chief contribution of this research to the facilitation and mediation literature is its emphasis on facilitative aesthetics, such as the crafting and shaping of mediating representations. It extends

previous work on software-assisted facilitation by highlighting the aesthetic and experiential dimensions, including facilitative sensemaking, and by describing the active engagement of facilitators with software tools as *expressive* media, rather than simply as instrumental means to an end. It can help develop reflective approaches to training and professional development, expanding conceptions of what sorts of competencies matter in the development of effective facilitative representations.

The Framing model can provide a normative model for facilitation practices. The thesis extends models of facilitator competency such as Stewart (2006) and Mcfadzean (2002), to include situation-specific considerations such as those derived from the *Relating* and *Shaping* dimensions. Along with providing case studies of many of the kinds of competencies common to such studies, this thesis placed a unique emphasis on the relationship of practitioner actions on and regarding the mediating representations. The dimensions of special interest include the degree to which practitioners requested validation of changes to representations, the degree of practitioner intervention to get participants to engage with the representation, the degree and quality of practitioner attention to the textual, visual/spatial, and hypertextual refinement of representational shaping, the degree of 'finishedness' of the artifacts, and the ways practitioners balanced the need to work on the representation itself vs. interacting with the participants.

#### 9.1.2.5 Art-making as social or professional applied practice

The research in this thesis helps highlight the ineffable aspects (Boehner et al., 2008) of practitioner experience when attempting to combine aesthetic approaches with providing a facilitative service. It describes the multifaceted nature of the skills required to perform participatory representational practice. It can help define arts-based facilitative methods as a bounded research discipline with a coherent focus, and contributes analysis of a facilitative practice involving software tools used as representational media to a literature more concerned with non-computing-based media.

## 9.2 Limitations

This section discusses four principal limitations of the research described in this thesis: additional sources of data, sample size and diversity, the timescale of the studied sessions, and approach to validation of the findings.

### 9.2.1 Data sources

Although a primary concern of the thesis was practitioner subjectivity as reflected in action and lived performance, a key resource for understanding that subjectivity is the practitioners' own interpretation, as might be expressed in interviews, think-aloud protocols, or more detailed questionnaire instruments. Such means were not employed in this thesis. Interviewing practitioners to discover their perceptions and perspectives on their actions could yield a rich vein of data to complement the observational and questionnaire data analyzed in this thesis.

### 9.2.2 Sample size

As noted in Chapter 4, although the questionnaire responses provided interesting comparative data and helped characterize the studied practitioners on a variety of dimensions, the data had several limitations. The skill and experience assessments were self-reported and thus could vary widely in accuracy. The sample size was small, thus limiting the statistical validity of conclusions and comparisons (though valuable in descriptive and directional terms). In general, although the eight studied sessions and fourteen studied practitioners exhibited reasonable diversity, the small numbers limit the degree of representativeness that can be claimed. However, as Small notes in his study of student responses to poetry (which employed a partially similar analytical approach to this thesis), while the findings themselves were tentative, the effort was concerned "as much with testing the model on a range of 'real' responses as with drawing firm conclusions from what it revealed" (2009: 255). Due both to the small sample size and the fact that most of the studied practitioners were of the same national origin and similar professional backgrounds, the thesis does

not examine the role that might be played by cultural differences in the findings (Bertelsen & Pold, 2004; Tractinsky, 1997).

### 9.2.3 Timescale of studied sessions

The sessions studied in this thesis were all single events (even though the Mobile Agents sessions were parts of a longer-term project, and there was some cross-referencing between the Hab and RST sessions). As such the thesis did not examine the kinds of shaping and sensemaking that would occur over multiple sessions and longer-term projects. This would be of special interest for hypermedia research.

### 9.2.4 Validation of findings

The thesis did not perform "member checks" or do systematic validation of its findings either with the studied practitioners, or with other working practitioners. However, as briefly described below, two preliminary attempts were made to validate portions of the approach with researchers and practitioners in workshop settings.

## 9.3 Implications

As argued by many of the researchers reviewed in Chapters 2 and 3, professional expertise is not simply a matter of choosing and applying tools and methods. It requires fine-grained and situation-specific choices about not only techniques, but how to respond to the emergent needs and contextual characteristics of a practice situation. These can shift many times in the course of an instance of practice. Looking closely at practice reveals that the choices of how to apply tools and methods – the form a practitioner gives their practice in a given situation (i.e., aesthetic choices) – are indissolubly and inevitably bound up with situational ethics – the ways practitioner choice-making is connected to the interests, desires, and subjectivities of participants, clients, and other stakeholders. This is true not only for ostensibly "representational" practices such as the participatory representational practices studied in this thesis, but in the broader arena of professional practices in general. Most professionals choose and apply tools and methods in specific

contexts in ways that are inextricably bound up with, and affecting of, their clients and participants. Such choices are never value-neutral and never without ethical consequences, even if the practitioner believes them to be.

This research charts new ground in focusing on the specifically *aesthetic* aspects of practitioner action *as they affect other people* (the ethical aspects). While not all the qualitative dimensions discussed in Chapters 6 through 8 emphasized aesthetic and representational matters, many of them did. Artifactual sensemaking – the specifically aesthetic aspects of sensemaking responses – is an important focus for future research. Figure 9.2 extracts the specifically aesthetic dimensions of the taxonomy presented in section 8.4. It shows how aesthetic considerations play a part in many aspects of practitioner experience, and provides analytical handles through which instances of practice can be examined through an aesthetic lens. However, as argued throughout this thesis, aesthetics in professional practice cannot be understood in isolation from ethics and the other experiential factors. A key implication of the research is that there is now a method that foregrounds such considerations for discussion and reflection by practitioners and researchers. Applying this method will deepen understanding of the nature of professional practice, enabling practitioners and researchers to see, discuss, and reflect on the ways in which the aesthetic and ethical aspects of their practices intertwine. This thesis provides many examples that researchers and practitioners can consult in how to "read" the moment-to-moment activities in a session, for the elements of practitioner experience in crafting representations and responding to participants and others. It can be used to identify, diagnose, and reflect on individual choices and moves *in situ*. By doing so it can augment the large extant body of research that is aimed at larger-grainsize choices, such as what approach to take for a project or group as a whole.

| Planning |
| --- |
| Granularity of pre-created structure |

| Framing |
| --- |
| Narrative consistency, usefulness |
| Inclusiveness of narrative framing |
| Evocativeness of narrative framing |
| Clarity of artifacts |
| Openness, dialogicity of artifacts |
| Resistance from participants, materials |
| Addressing participant impulses, desires |

| Sensemaking Triggers |
| --- |
| Representational structure |

| Shaping |
| --- |
| Textual refinement |
| Visual/spatial refinement |
| Hypertextual refinement |
| Finishedness of artifacts |
| Density of shaping moves |
| De-linked interaction with representation |

| Sensemaking Response Aesthetics |
| --- |
| Direct contribution to shaping |
| Intended to help participant shaping |
| Creating space for remedial shaping |
| Partially having to do with shaping |
| No aesthetic dimension |

**Figure 9.2: Specifically aesthetic dimensions of the taxonomy introduced in Figure 8.6**

The methods developed and applied in this thesis provide analytical tools aimed at discerning these types of considerations. However, there is a need to make the methods more tractable. This thesis was a discovery effort aimed at remedying the gap in current research for practicable methods for studying and comparing practitioner experience in participatory representational practice. The research reported a search for such a method, iterative development of the method, and successful application of the method in studying and comparing eight diverse instances of actual practice. However the process required hundreds, if not thousands, of hours of analysis time before arriving at the findings presented in this thesis. Now that the constructs and tools exist, future research can determine ways to make the application of the methods less time-consuming and more applicable to time-limited research and professional development settings. The following section expands on this and other areas for future research.

## 9.4 Future work

This section outlines future directions for this line of research. Several of the themes could be combined in the same study or studies. All of them can extend the methods employed in this thesis

to include practitioner interviewing and reflections, along with observations, as additional means to understand the practitioner experience

### 9.4.1 Dissemination to the HCI/CSCW research community

It is intended that four self-contained papers distilling this research would be of interest to the research communities working in *Human-Centered Informatics* and *Computer Supported Cooperative Work*:

- A *theoretical* paper would show how experiential concepts can be applied to professional practice, rather than the user/receiver constructs that dominate the current literature, emphasizing the connections between aesthetic and ethical dimensions of practice.

- A *research methods* paper would explain the analytical method and demonstrate how it can be used to analyze instances of professional practice in experiential terms. Its focus would be on the ways the individual session analysis dossiers can be used for comparative analysis.

- Two *findings* papers would show the successful application of the methods to understand the instances of participatory representational practice studied, and detail the implications for a more elaborated understanding of such practices specifically, and professional practice in general. One such paper would focus specifically on the sensemaking aspects, and the other on the shaping and framing dimensions.

### 9.4.2 Resources for professional practitioners

The theory and methods developed in this thesis need to be made tractable and actionable to be of use to busy professional practitioners. The researcher will create a website containing informative theory in digestible "snippets" and practical methods and exercises to be used for reflective practice workshops and training curricula. The goal is to enable trainers and educators to help develop both novice and experienced practitioners understand their own practice better. The site will provide examples of each analysis technique and how it can be applied in time-constrained contexts (e.g.

what can be done in a half a day, two days, a week, or a semester length). It will provide sample curricula and readings for the conceptual and theoretical components, as well as example movies, how-to guides, instructor notes, and participant notes.

The methodology would include techniques for assessing learners that respect the continuum from aesthetic and experiential to efferent, without necessarily privileging one end of the spectrum. It will enable self- and peer- assessment of participatory representational practice, based on a set of values that highlight aesthetic experience and engagement without leaving out the practical, shared, and constructive aspects of working with groups in applied settings.

The intent is to create a collaborative environment for reflective practice similar to what Macfarlane (2002) advocates for mediators. Developing the level of skill evidenced by sophisticated approaches such as the expert hypermedia-based facilitation in the Mobile Agents project can be challenging, not only due to the breadth and combination of skills required (group process facilitation, rapid hypermedia software manipulation, facility with conceptual modeling frameworks), but because the expertise itself is not yet well enough understood to develop effective training (Yoong & Pauleen, 2004).

This approach will help both novice and experienced practitioners to become more intentional and reflective in their practices, enabling them to become more participant-centered, and to both ask and solicit more "higher-ordered" questions (Sawyer, 2004: 18). An emphasis on the "ensemble" aspects of improvisation – the ways in which participant and practitioner collaborate in dilemmatic moments and in the face of imperfect information – will lead to a better understanding of the "collective learning" that can take place, and of how to bring it about. Incorporating the concepts of "disciplined improvisation" can help practitioners learn to discern when to stick to routines and to gauge the scope and scale of their improvisation.

As a first step in this direction, two preliminary 'proof of concept' sessions applying the constructs from the research were held in workshop settings with professionals and researchers. They examined ideas of participatory representational practice and featured reflections on actual practice, using very different media from those studied in this thesis. The first attempt was held at a graphic facilitators' conference in 2009, and the second at a university knowledge media department in 2010. In each, professionals and researchers were given a short presentation on the main concepts of this research, then performed a participatory representational activity. Following this, they reflected on the ways in which the concepts helped illuminate experiential dimensions of the practice. Participant comments[18] indicated that the concepts resonated with the audience:

- "He really has thought about the he*art* [sic] of our profession"
- "A new way to think about group work"
- "In every way -- This opens whole new worlds for me -- "
- "I liked the clarity of the heat maps"
- "Participatory practice could be a whole other domain to explore. This framework could be really interesting in educational settings!"
- "METAPHORS that emerged as the session/ideas unfolded: - the 'dance' between practitioner/participants; - the unfolding of a real time event as wild kayak paddle down a turbulent river"
- "Constantly linking aesthetics & ethics"
- "Coherence, engagement + usefulness resonate as criteria that could be applied to many processes, i.e. teaching"

[18] For additional details see http://people.kmi.open.ac.uk/selvin/data/IFVPSessionEvaluations.htm

### 9.4.3 Longitudinal studies

Unlike the research in this thesis, which looked at single sessions, a longitudinal study would follow a group of participatory representational practitioners engaged in a long-term project or projects, with the goal of characterizing shaping, framing, and sensemaking over the events and challenges of such a project.

### 9.4.4 Comparative practices

This thesis focused on use of the Compendium hypermedia tool, but there are promising applications for other forms of participatory representational practice. Future studies can compare across multiple practices. These could include other types of software, graphic facilitation, "plain" facilitation involving whiteboards and easel sheets, non-facilitated practices, GSS facilitation, "e-facilitation" and virtual team research, and participatory design.

### 9.4.5 Analytical tool development

A primary contribution of this thesis is the development of analytical techniques for studying participatory representational practice. Some aspects of these, such as the identification of representational move types, multiplicity and heterogeneity of focus aspects, and density of verbal and representational moves, could be built into software tools, automating the creation of analytical artifacts, such as Grid analyses, on a broader scale.

### 9.4.6 Artifactual sensemaking

A key focus for this thesis was the role of the representational artifact itself in the sessions. That focus can be extended and sharpened in future studies. Such studies can better characterize the specific role a representation can play in a session, and the relationship of practitioners and participants to it. These include: in what ways does a representation speak for itself? What role does the artifact actually play, both during the session and after? What is the value of the artifact, proportional to coherence, engagement, and usefulness of the work and talk in a session? How do practitioners create situationally appropriate interventions, when the representation itself matters

to the larger effort? What things do practitioners and participants do to make a session work? Why did they do them? What impact or effect did they have?

### 9.4.7 Action research

One of the early directions explored in the work leading up to this thesis was in the form of action research pilot projects. This involved the researcher's participation in a longitudinal study of an effort to create a large information resource, for a community, school, or other non-profit group. This approach could be used fruitfully to extend this research: the researcher would train community members or students in use of hypermedia techniques to create, for example, a website about a community issue such as drug use, and also to facilitate meetings with other community members. The research effort would study the evolution of the group's practices over time, and their changing ability to create coherent, engaging, and useful representations in such a context. It could extend approaches such as Rheingold describes for "public voice" participatory media projects: "What if teachers could help students discover what they really care about, then show them how to use digital media to learn more and to persuade others?" (2008: 99). The approach could be extended to other forms of participatory representational practice, such as collaborative representations like GIS-based public health projects and other uses of data-enriched maps. Employing an action research framework would allow the researcher's own involvement, reflections on practice, and interventions to be included as subject matter in the study.

## 9.5 Conclusion

This thesis began with Schön's call for *an epistemology of artistry in professional practice*, a theme that has informed this research effort since its inception.

It seems appropriate to give Schön some of the final words as well:

> The practice context is different from the research context in several important ways, all of which have to do with the relationship between changing things and understanding them. The practitioner has an interest in transforming the situation from what it is to something he likes better. He also has an interest in understanding the situation, but it is in the service of his interest in change. (1983: 147)

> We know very little about the ways in which individuals develop the feel for media, language, and repertoire which shapes their reflection-in-action. This is an intriguing and promising topic for future research. (1983: 271-2)

This thesis set out to describe participatory representational practice in such a way as to give respect and credence to the actual experience of such practices. It intended to honor what practitioners confront and overcome through their skills, creativity, and responsiveness to others. It is hoped that this work will help to foster more effective, as well as ethical, representational practices.

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# 11 Appendices

## 11.1 Questionnaire instrument[19]

**Knowledge Media Institute – Open University**
**Participatory Hypermedia Research Project**

Thank you for participating in the sessions today. It would greatly help our research efforts if you would complete this questionnaire. The answers will be kept in complete confidence and we will only use your name and contact information (optional) to contact you for follow-up questions. There are no right or wrong answers; please feel free to add any notes or comments for any of the questions.

We appreciate your time and your participation

---

**1. How long have you been using Compendium?**

(circle one)

Never used  < 1 month  1 month to 1 year  1 to 2 years  2-5 years  > 5 years

---

**2. How long have you acted as a facilitator of groups *in any capacity, whether or not using software*?**

(circle one)

Never  < 1 month  1 month to 1 year  1 to 2 years  2-5 years  > 5 years

---

**3. How long have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Decision Explorer, GroupSystems, etc.) in a shared display*?** (circle one)

[19] Practitioner free-text comments entered on the questionnaire can be found at

http://people.kmi.open.ac.uk/selvin/data/PractitionerComments.htm.

Never  < 1 month  1 month to 1 year  1 to 2 years  2-5 years  > 5 years

---

**4. How long have you acted as a facilitator of groups *using Compendium in a shared display*?** (circle one)

Never  < 1 month  1 month to 1 year  1 to 2 years  2-5 years  > 5 years

---

**5. How many times or sessions have you acted as a facilitator of groups *in any capacity, whether or not using software*?**

(circle one)

Never  1-5 times  6-20 times  21-50 times  More than 50 times

---

**6. How many times or sessions have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Explorer, GroupSystems, etc.) in a shared display*?** (circle one)

Never  1-5 times  6-20 times  21-50 times  More than 50 times

---

**7. How many times or sessions have you acted as a facilitator of groups *using Compendium in a shared display*?**

(circle one)

Never  1-5 times  6-20 times  21-50 times  More than 50 times

---

**8. What is your preferred software for group facilitation (if any)?**

(please fill in the blank; more than one answer is acceptable)

_____

_____

_____

---

**9. How would you describe your skill level with *knowledge mapping / concept mapping software of any kind, (e.g. Compendium, CMapTools, MindManager, etc.)*?**

(circle one; 1 = LOW level of skill, 5 = HIGH level of skill)

1 2 3 4 5

---

**10. How would you describe your skill level with the *Compendium* software?**

(circle one; 1 = LOW level of skill, 5 = HIGH level of skill)

1 2 3 4 5

---

**11. How would you describe your skill level as a group facilitator?**

(circle one; 1 = LOW level of skill, 5 = HIGH level of skill)

1 2 3 4 5

---

**12. How would you describe your level of technical proficiency with software, in general?**

(circle one; 1 = LOW level of proficiency, 5 = HIGH level of proficiency)

1 2 3 4 5

---

**13. How familiar are you with hypermedia and hypertext concepts?**

(circle one; 1 = LOW level of familiarity, 5 = HIGH level of familiarity)

1 2 3 4 5

---

**14. In today's event, what role(s) did you play in the *small group planning session*?**

(circle all that apply)

Mapper (hands on the keyboard) Facilitator (moderating the group)

Other (please describe) _____

None

---

**15. How satisfied were you with the results of the *small group planning session*?**

**(circle one; 1 = LOW level of satisfaction, 5 = HIGH level of satisfaction)**

1 2 3 4 5

---

**16. Please comment: What went well in the *small group planning session?* Why?**

(you may write on back if necessary)

---

**17. Please comment: What *did not* go well in the *small group planning session?* Why?**

(you may write on back if necessary)

---

**18. In today's event, what role(s) did you play in the *large group session that your group facilitated*?**

(circle all that apply)

Mapper (hands on the keyboard) Facilitator (moderating the group)

Other (please describe) _____

None

---

**19. How satisfied were you with the results of the *large group session that your group facilitated*?**

(circle one; 1 = LOW level of satisfaction, 5 = HIGH level of satisfaction)

1 2 3 4 5

---

**20. Please comment: What went well in the *large group session that your group facilitated?* Why?**

(you may write on back if necessary)

---

**21. Please comment: What *did not* go well in the *large group session that your group facilitated?* Why?**

(you may write on back if necessary)

---

**22. Please provide any other comments on any aspect of today's event. We are especially interested in hearing about any obstacles you or your group faced and what you did to overcome them. You may also comment on any of the sessions that other groups facilitated.**

(you may write on back if necessary)

---

**23. Are you** (circle one): Female Male

---

**24. What is your nationality?** (please fill in the blank**)** _____

---

**25. What is your profession?** (please fill in the blank) _____

Thank you very much!

.....

OPTIONAL (will only be used to contact you for follow-up questions)

Name (please print): Telephone:

Email:

## 11.2 Questionnaire responses by practitioner

This section shows bar graphs indicating how each practitioner responded to the skill and experience questions on the practitioner questionnaire.

### *A.1 Length of use of Compendium*

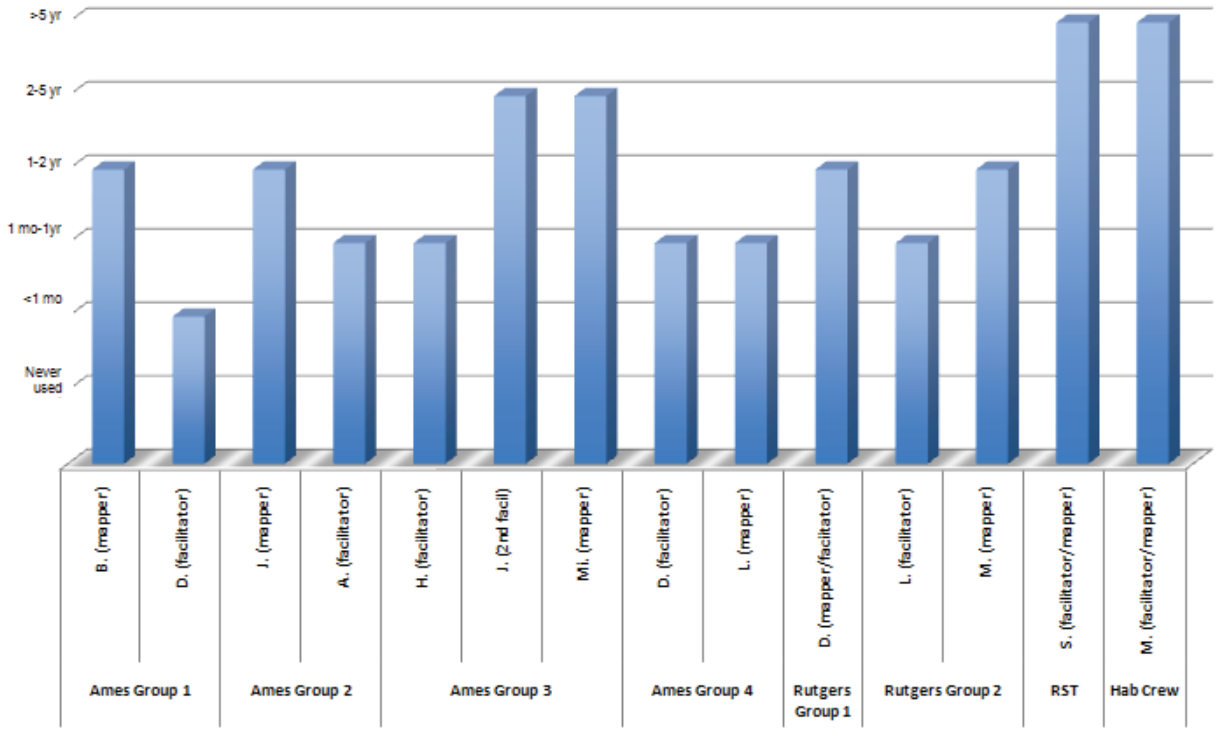



**Figure 11.1: Length of time using Compendium**

Figure 11.1 shows responses to the question "1. How long have you been using *Compendium*?"

## *A.2 Length of time as a facilitator*

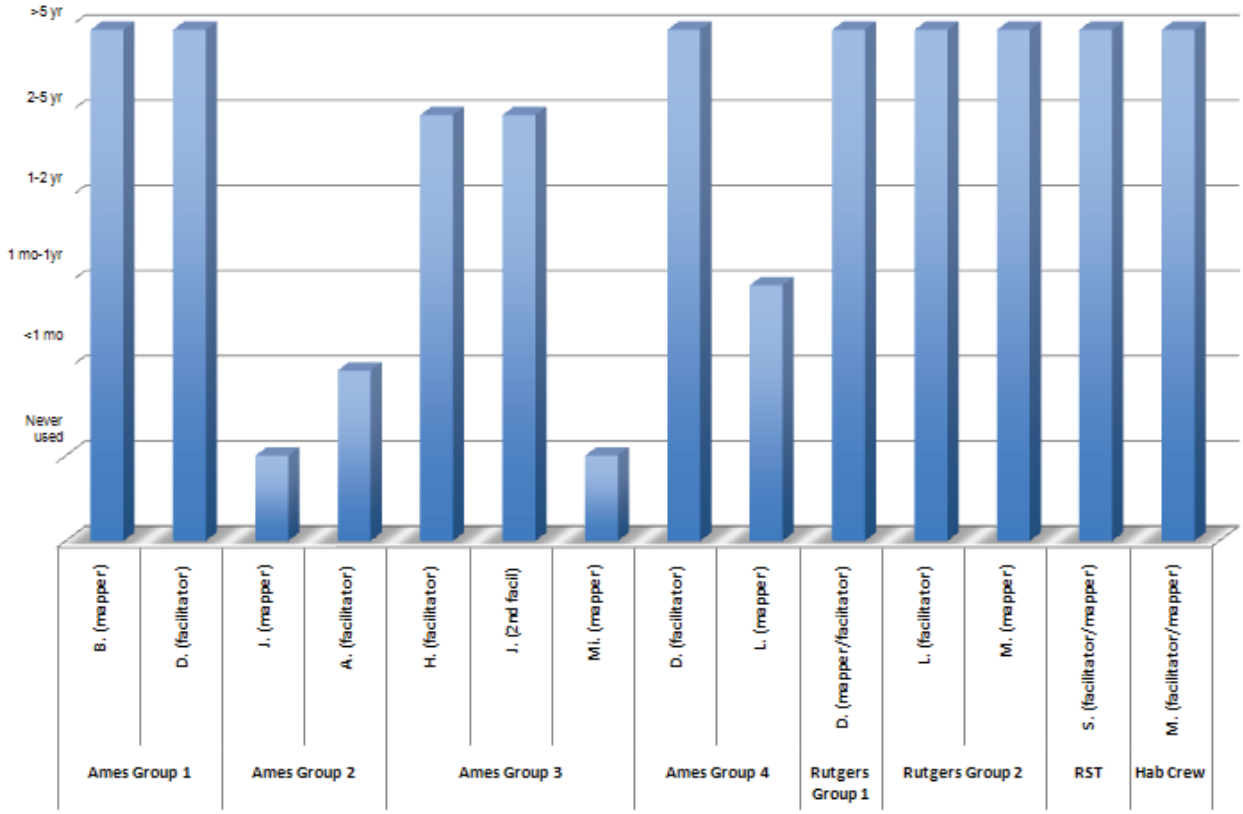



**Figure 11.2: Length of time as a facilitator**

Figure 11.2 shows responses to the question "How long have you acted as a facilitator of groups *in any capacity, whether or not using software*?"

## *A.3 Length of time facilitating using software in a shared display*

Figure 11.3 shows responses to the question "How long have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Decision Explorer, GroupSystems, etc.)in a shared display?*"

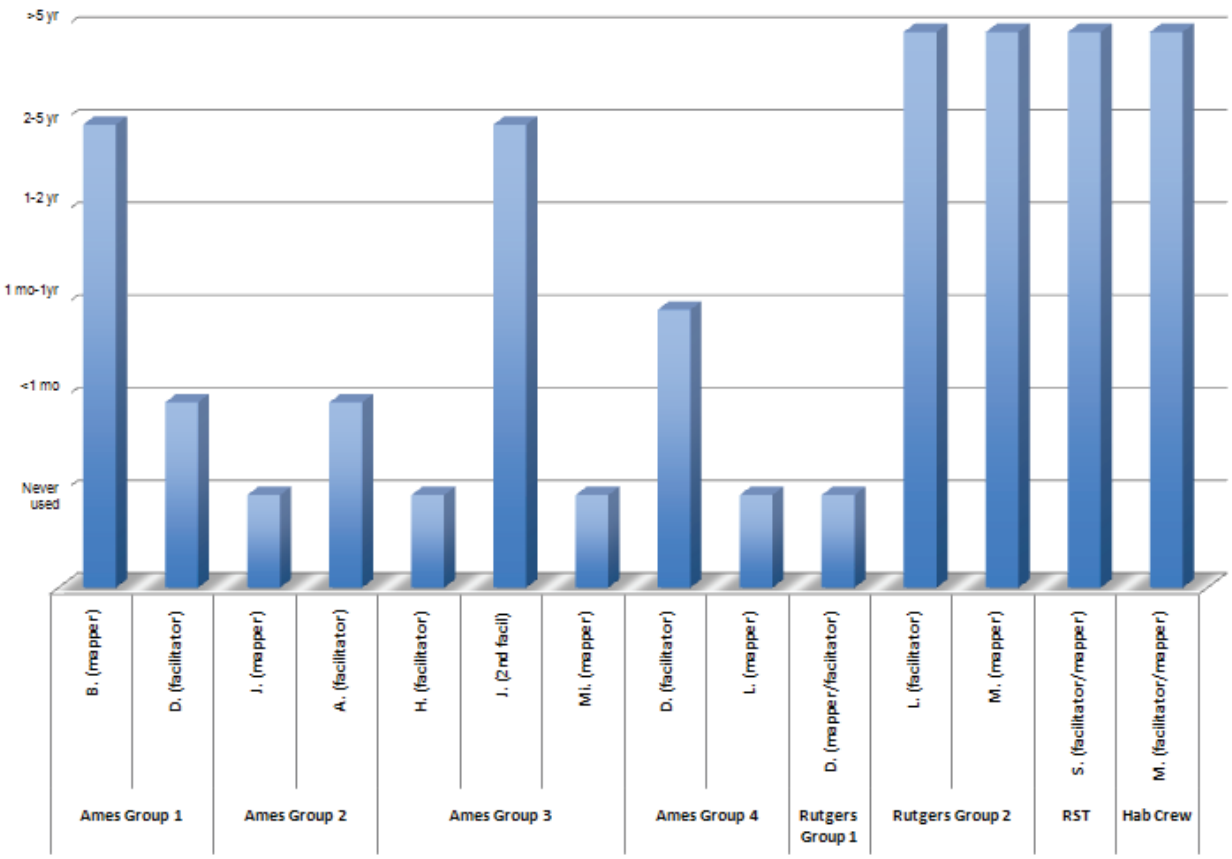



**Figure 11.3: Length of time facilitating using software in a shared display**

## *A.4 Length of time as a facilitator*

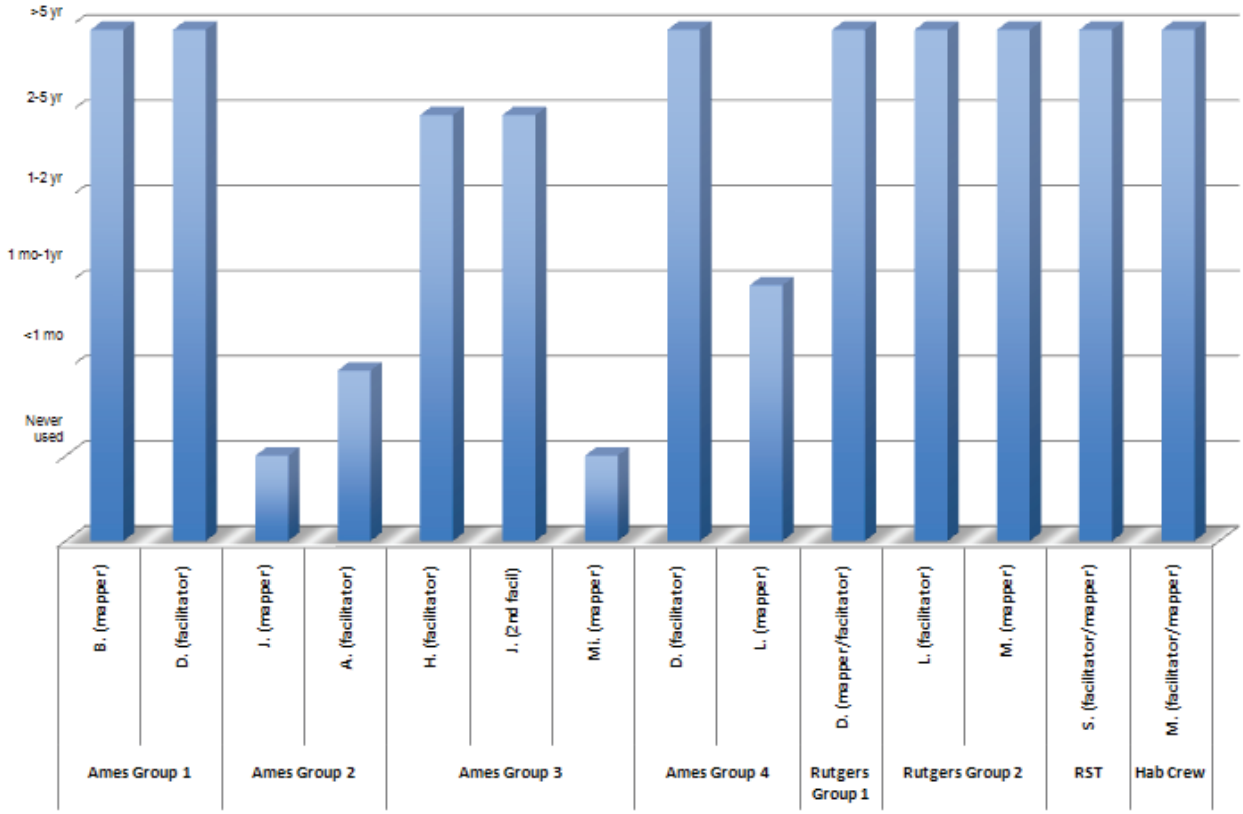



**Figure 11.4: Length of time as a facilitator**

Figure 11.4 shows responses to the question "How long have you acted as a facilitator of groups *in any capacity, whether or not using software*?"

## A.5 *Length of time facilitating using software in a shared display*

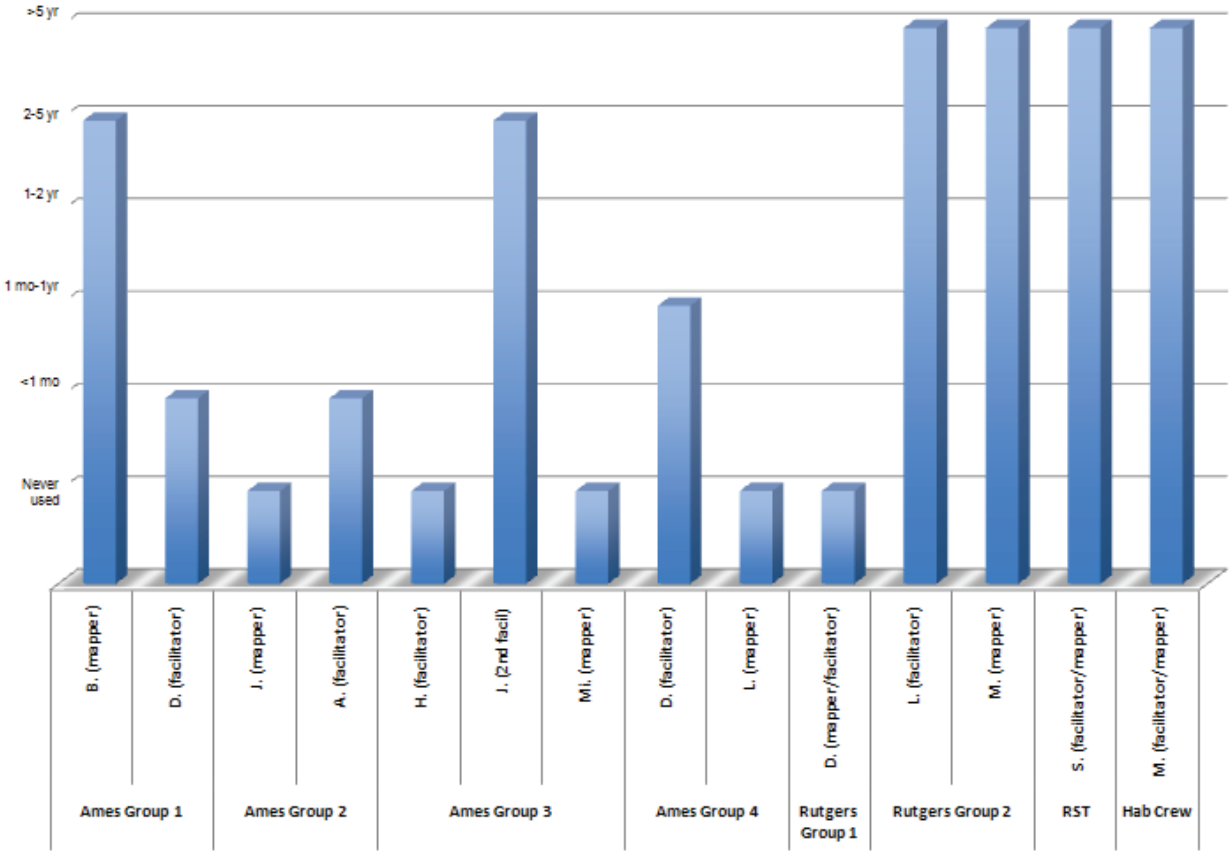



**Figure 11.5: Length of time facilitating using software in a shared display**

Figure 11.3 shows responses to the question "How long have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Decision Explorer, GroupSystems, etc.)in a shared display?*"

## *A.6 Length of time using Compendium in a shared display*

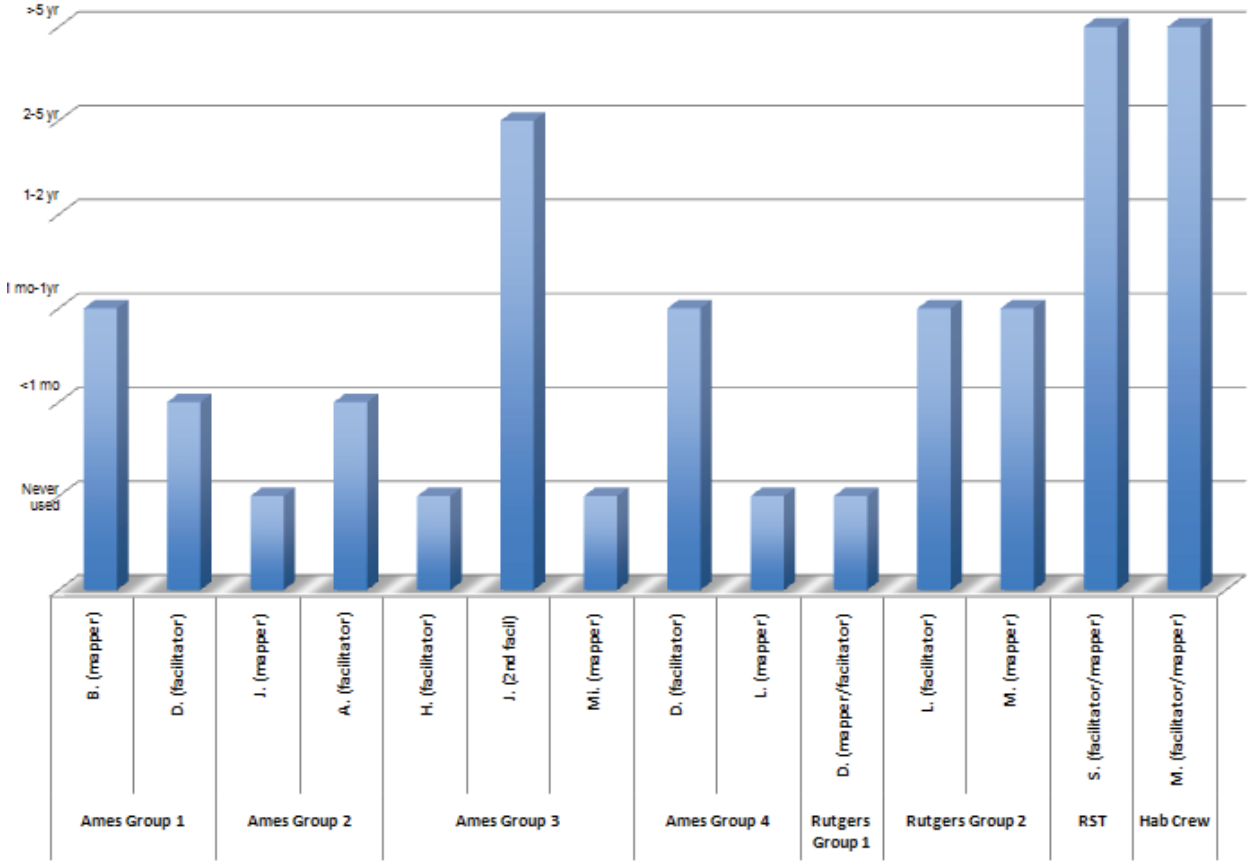



**Figure 11.6: Length of time using Compendium facilitatively in a shared display**

Figure 11.6 shows responses to the question "How long have you acted as a facilitator of groups *using Compendium in a shared display?*"

## *A.7 Frequency of acting as a facilitator of groups in any capacity, whether or not using software*

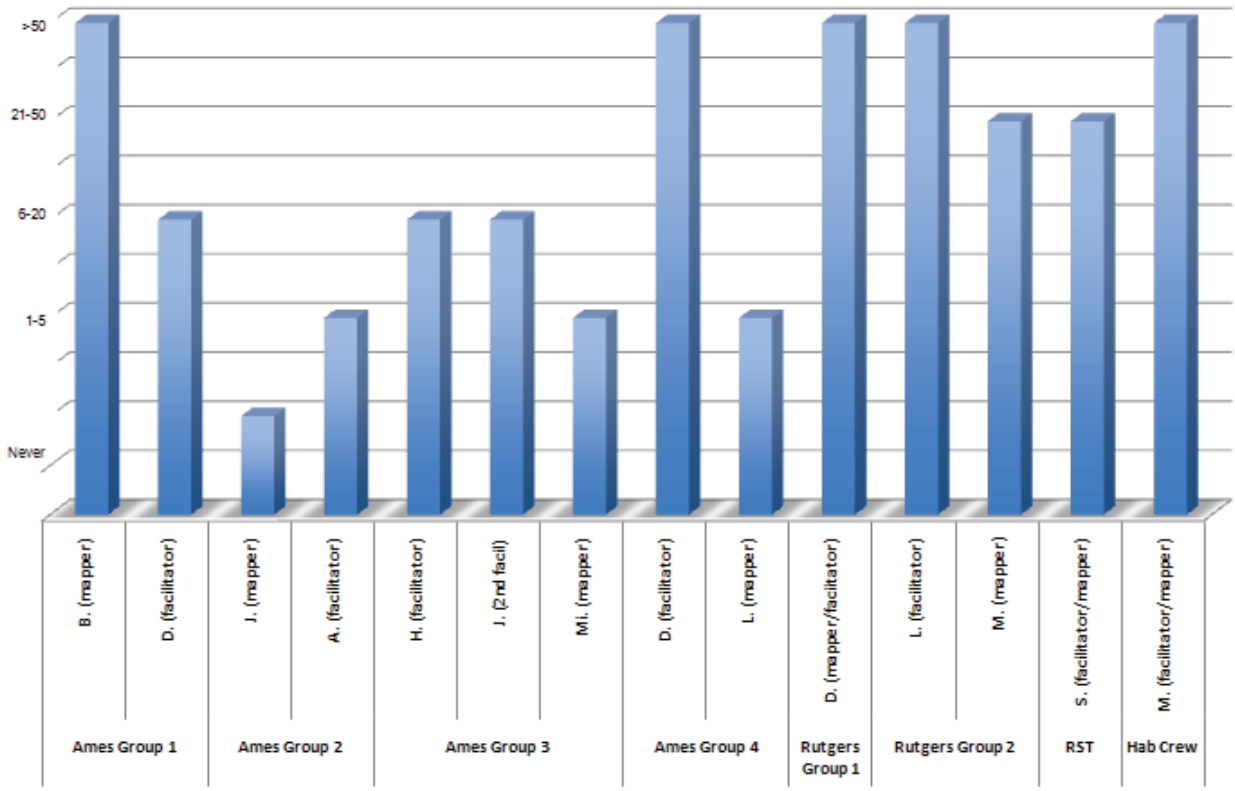



**Figure 11.7: Frequency of acting as a facilitator of groups in any capacity, whether or not using software**

Figure 11.7 shows responses to the question "How many times or sessions have you acted as a facilitator of groups *in any capacity, whether or not using software?*"

## *A.8 Frequency of acting as a facilitator using software in a shared display*

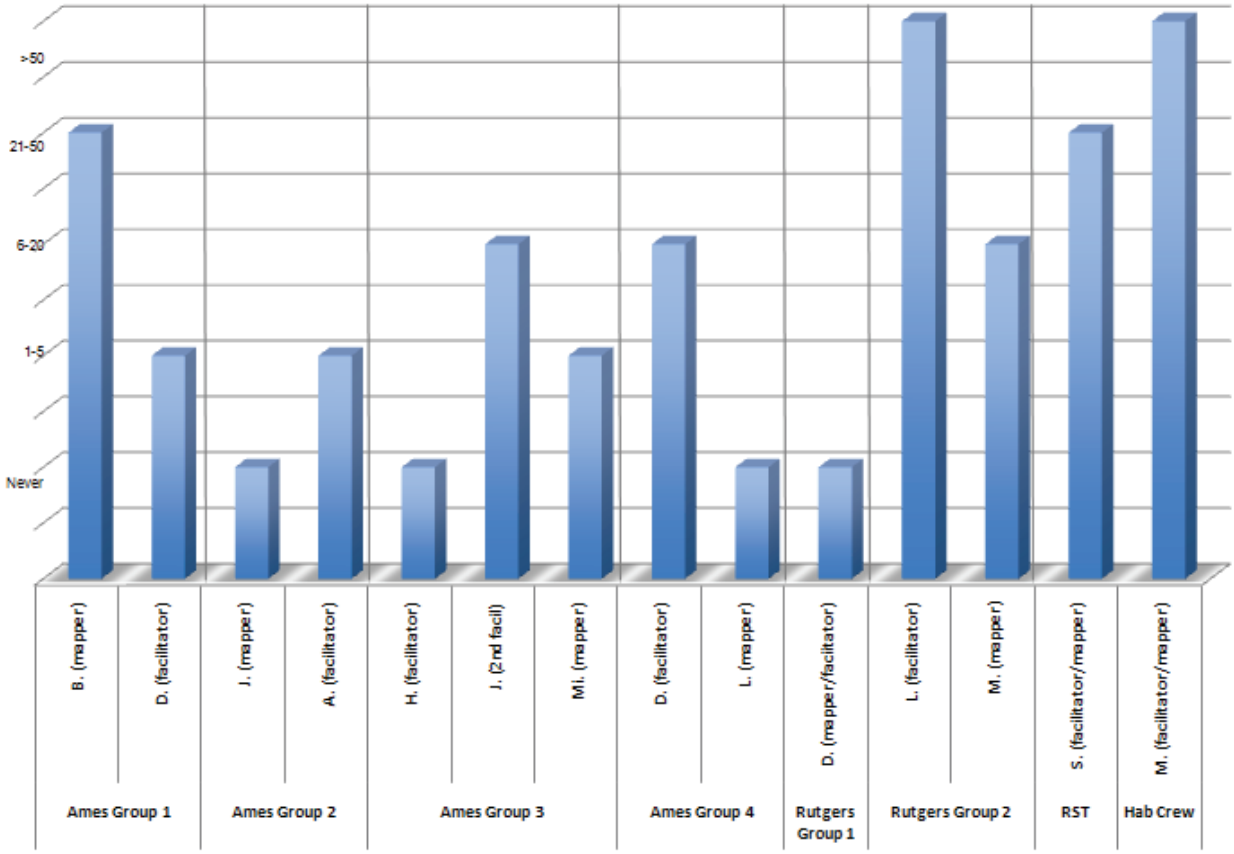



**Figure 11.8: Frequency of acting as a facilitator using software in a shared display**

Figure 11.8 shows responses to the question "How many times or sessions have you acted as a facilitator of groups *using any kind of software (Compendium, MS-Word, MindManager, Explorer, GroupSystems, etc.) in a shared display*?"

## *A.9 Frequency of acting as a facilitator of groups using Compendium in a shared display*

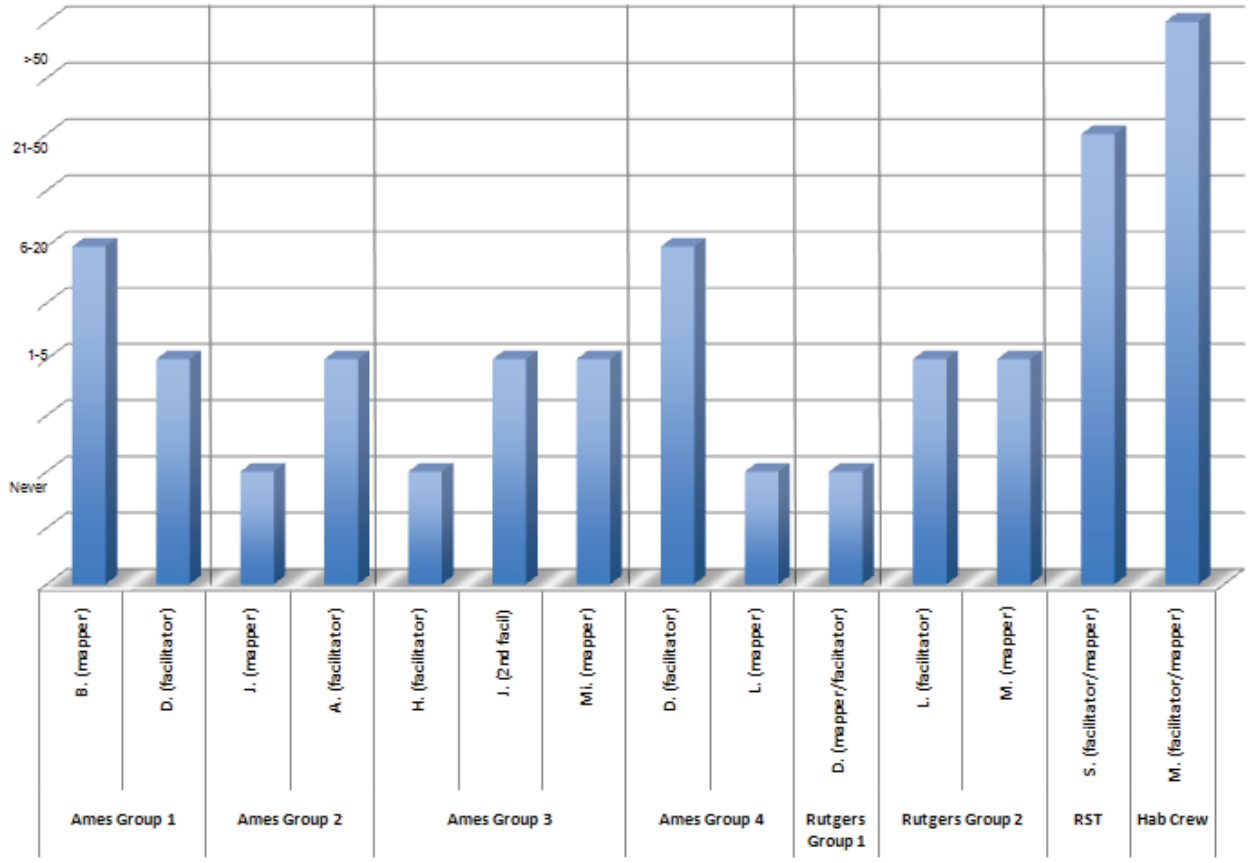



**Figure 11.9: Frequency of acting as a facilitator of groups using Compendium in a shared display**

Figure 11.9 shows responses to the question "How many times or sessions have you acted as a facilitator of groups *using Compendium in a shared display*?"

*A.10 Skill level with knowledge mapping / concept mapping software of any kind*

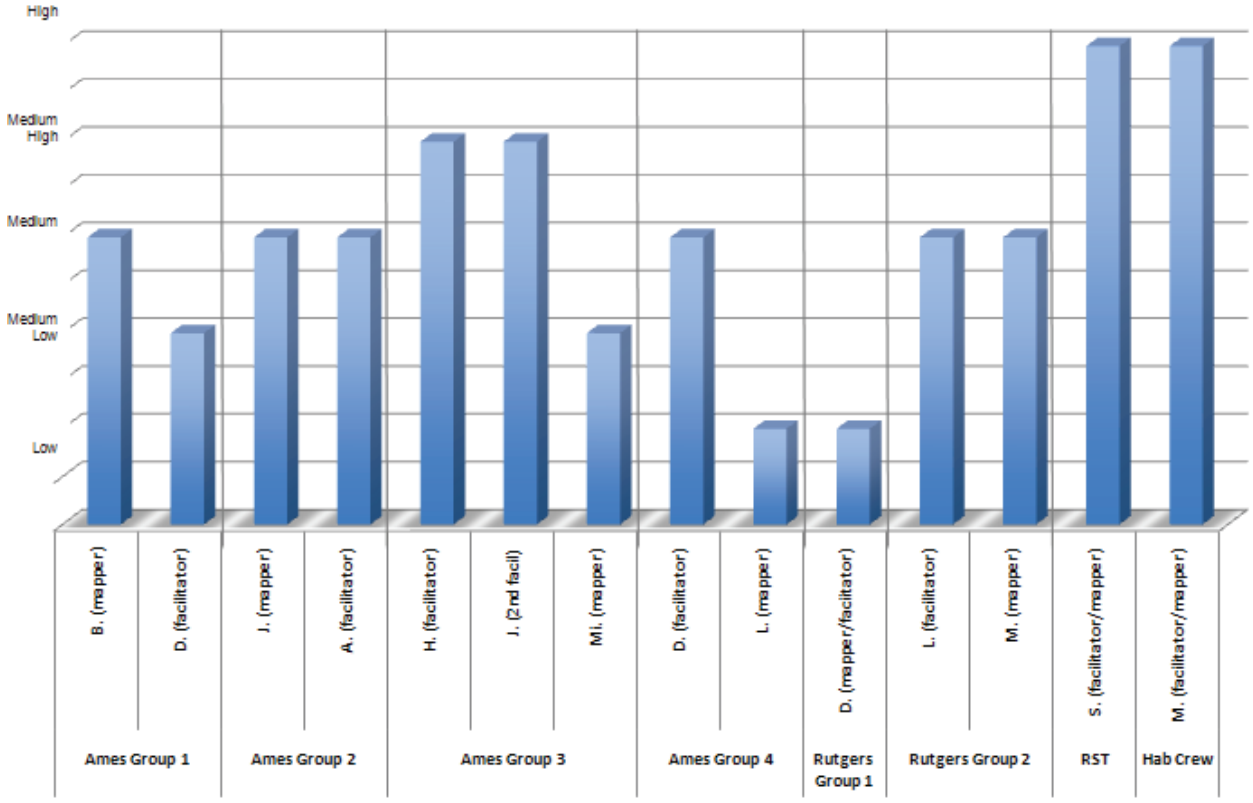



**Figure 11.10: Skill level with knowledge mapping / concept mapping software of any kind**

Figure 11.10 shows responses to the question "How would you describe your skill level with *knowledge mapping / concept mapping software of any kind, (e.g. Compendium, CMapTools, MindManager, etc.)?*"

## *A.11 Skill level with Compendium*

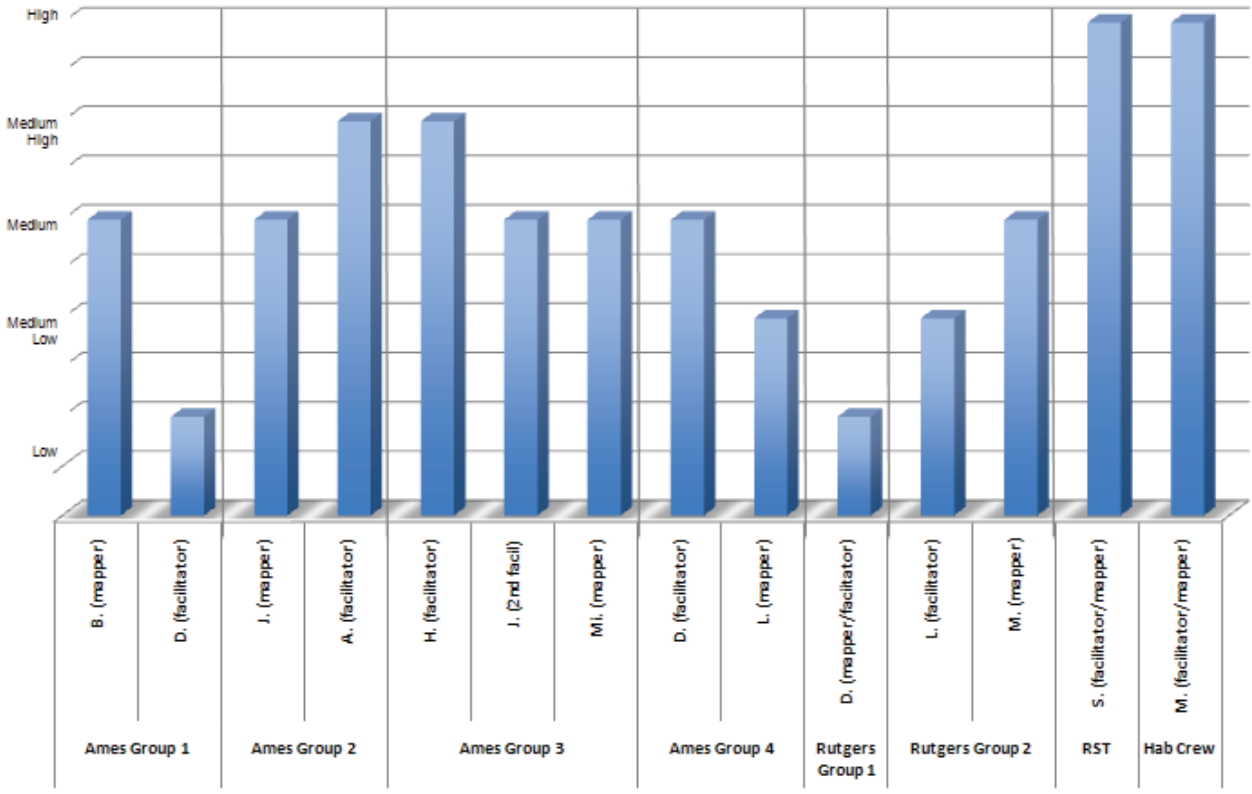



**Figure 11.11: Skill level with Compendium**

Figure 11.11 shows responses to the question "How would you describe your skill level with the *Compendium* software?"

## *A.12 Skill level as a facilitator*

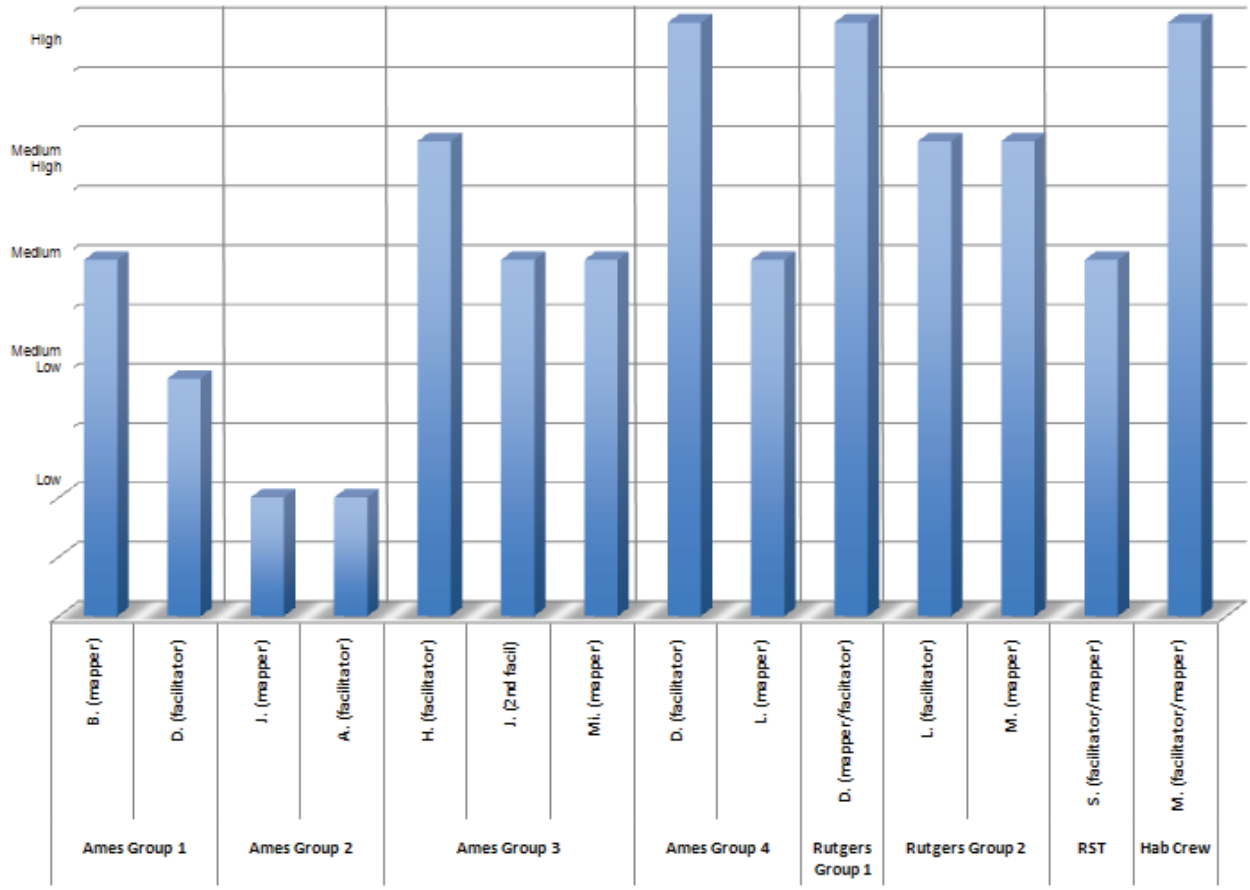



**Figure 11.12: Skill level as a facilitator**

Figure 11.12 shows responses to the question "How would you describe your skill level as a *group facilitator*?"

## *A.13 Level of technical proficiency with software*

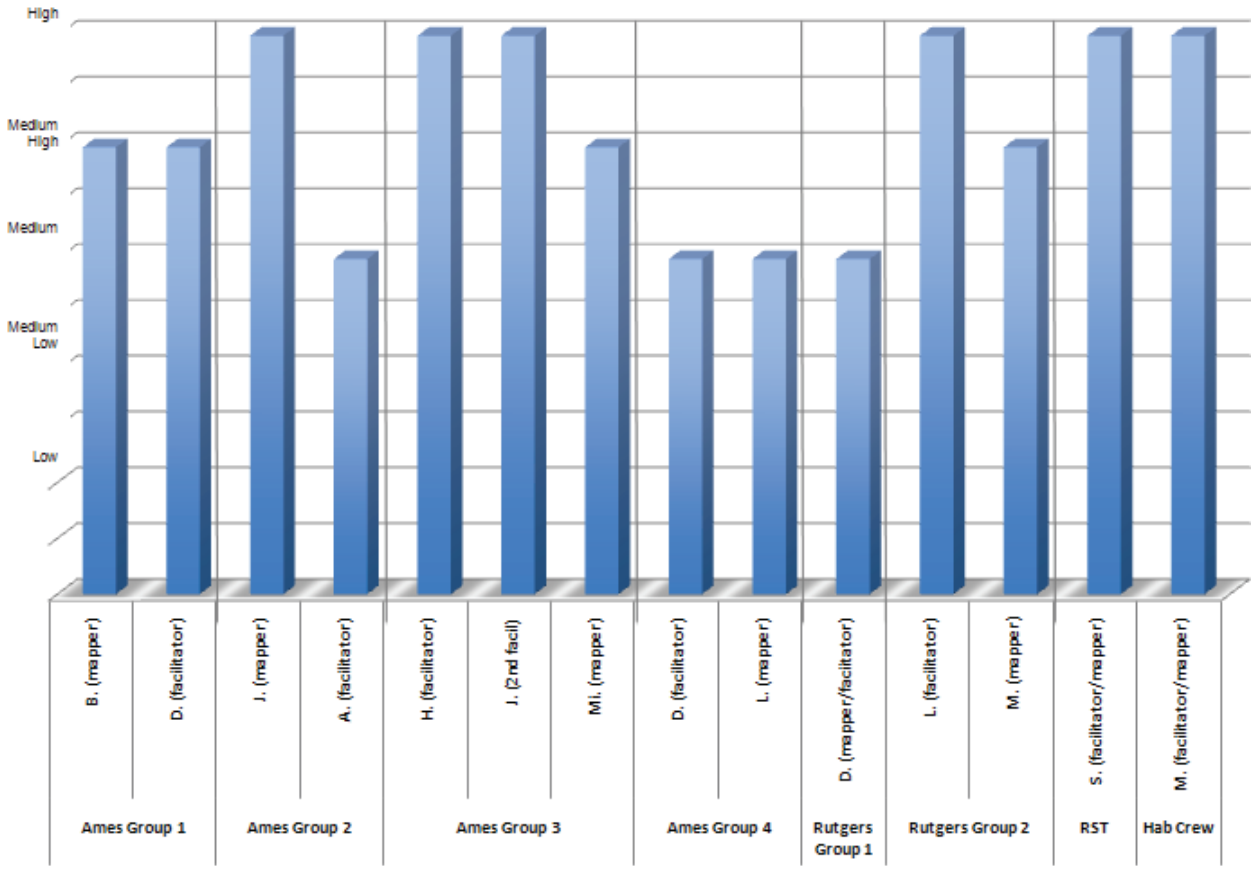



**Figure 11.13: Level of technical proficiency with software in general**

Figure 11.13 shows responses to the question "How would you describe your level of technical proficiency with *software, in general*?"

## *A.14 Familiarity with hypertext and hypermedia concepts*

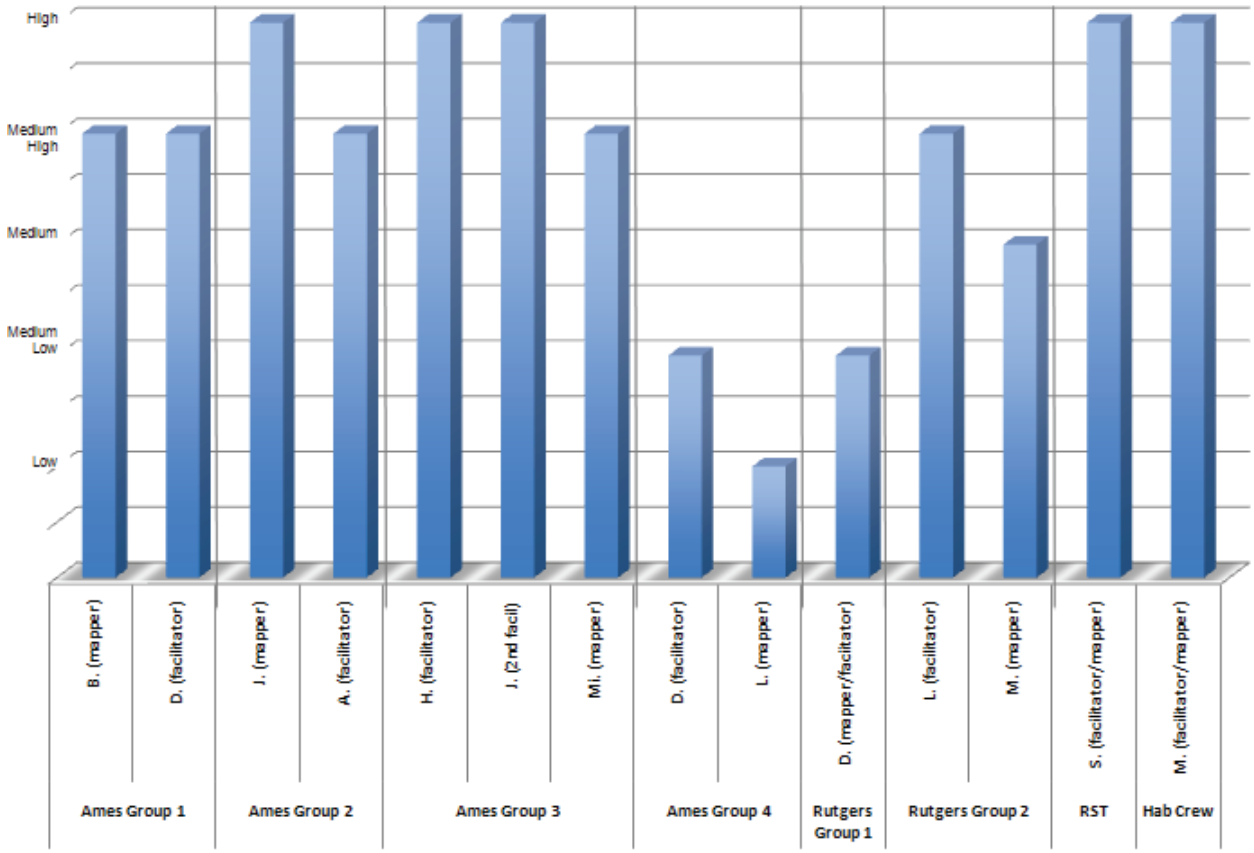
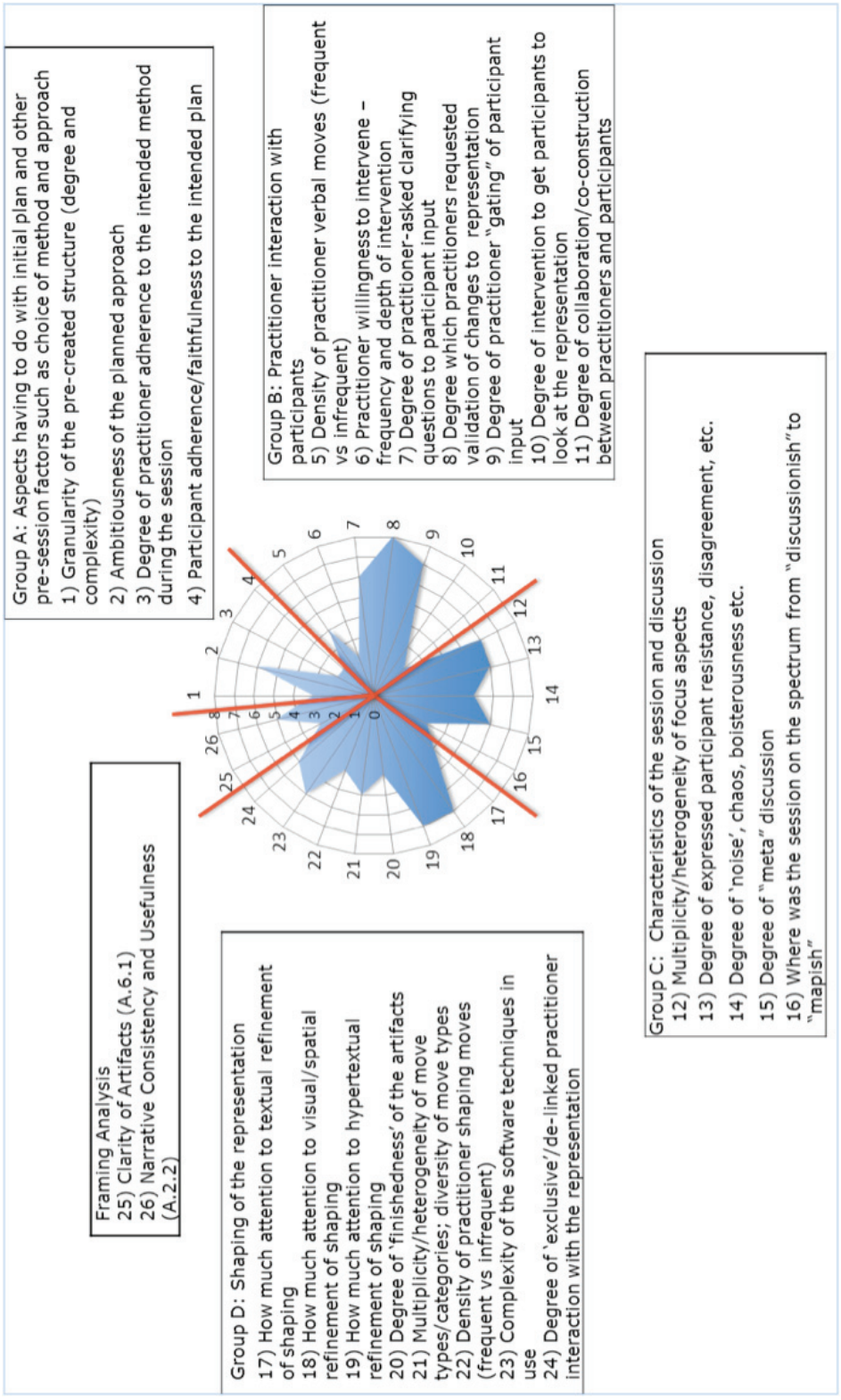



**Figure 11.14: Familiarity with hypermedia and hypertext concepts**

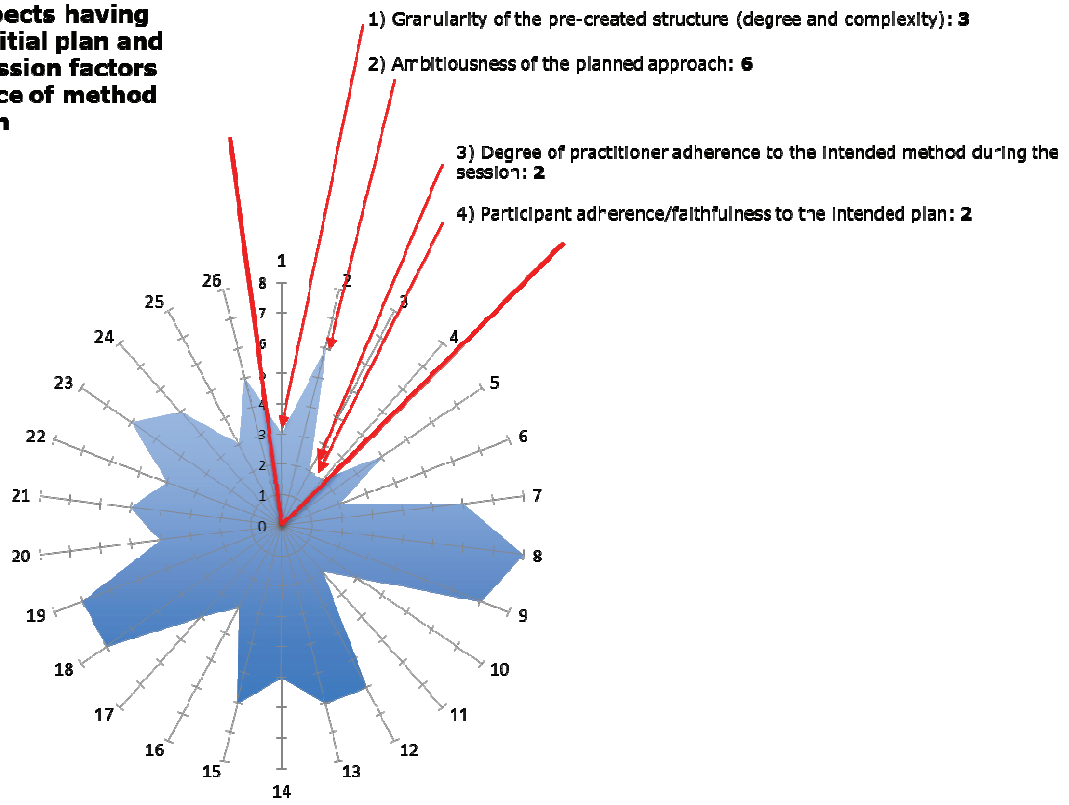
Figure 11.14 shows responses to the question "How familiar are you with *hypermedia* and *hypertext concepts*?"

## 11.3 Explanation of radar charts

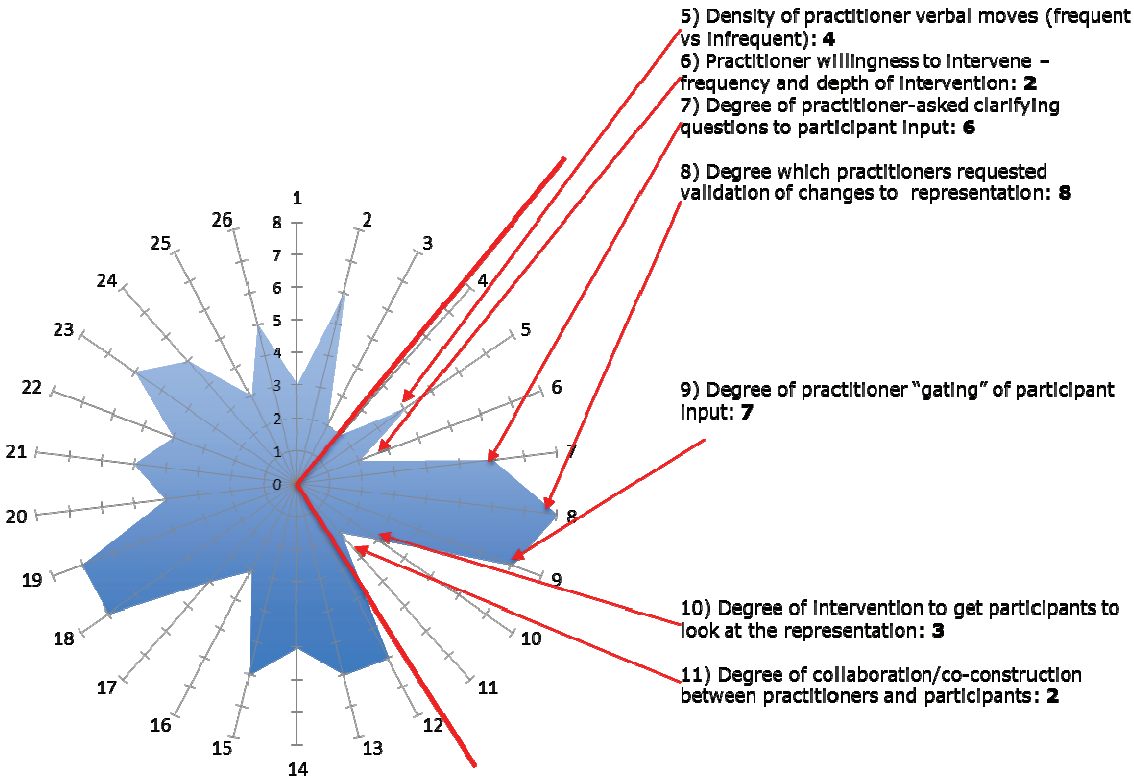
This section explains the radar charts included in Chapters 5 and 8 (Ames Group 3 as an example).



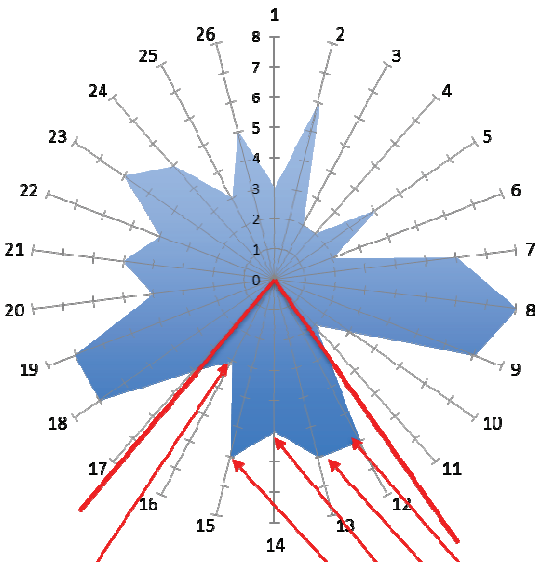
**Group A: Aspects having to do with initial plan and other pre-session factors such as choice of method and approach**




**Group B: Practitioner interaction with participants**



**Group C: Characteristics of the session and discussion**




16) Where was the session on the spectrum from "discussionish" to "mapish": **3**

12) Multiplicity/heterogeneity of focus aspects: **6**

13) Degree of expressed participant resistance, disagreement, etc.: **6**

14) Degree of 'noise', chaos, boisterousness etc.: **5**

15) Degree of "meta" discussion: **6**

**Group D: Shaping of the representation**

24) Degree of 'exclusive'/de-linked practitioner interaction with the representation: **5**

23) Complexity of the software techniques in use: **6**

22) Density of practitioner shaping moves (frequent vs infrequent): **4**

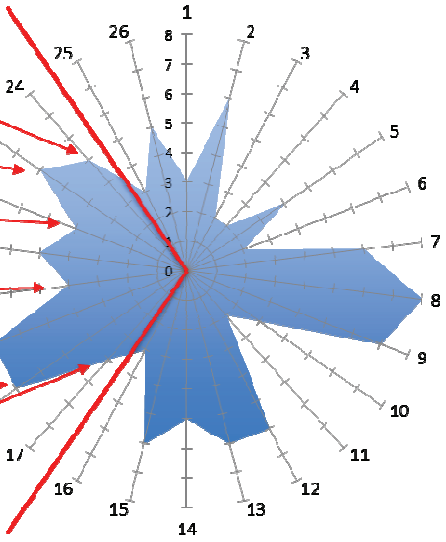
(21 removed)

20) Degree of 'finishedness' of the artifacts: **4**

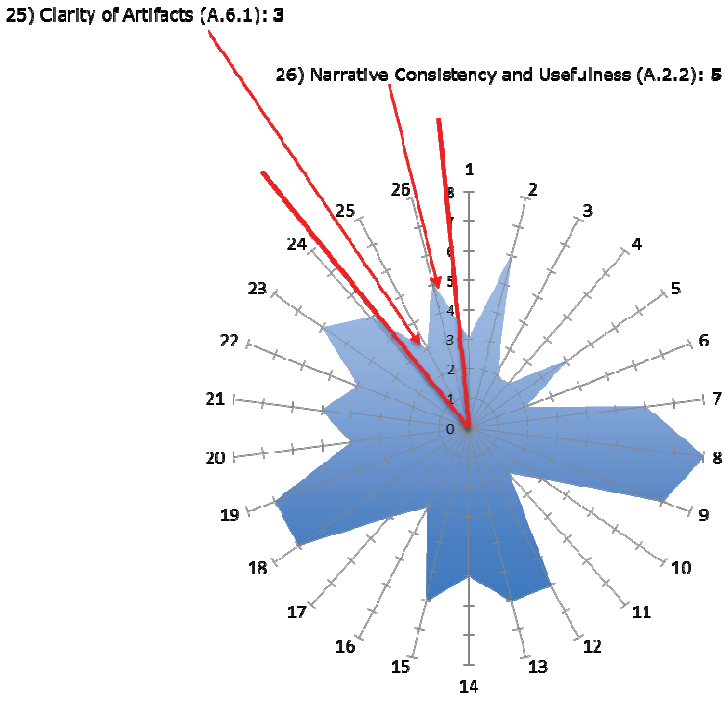
19) How much attention to hypertextual refinement of shaping: **7**

18) How much attention to visual/spatial refinement of shaping: **7**

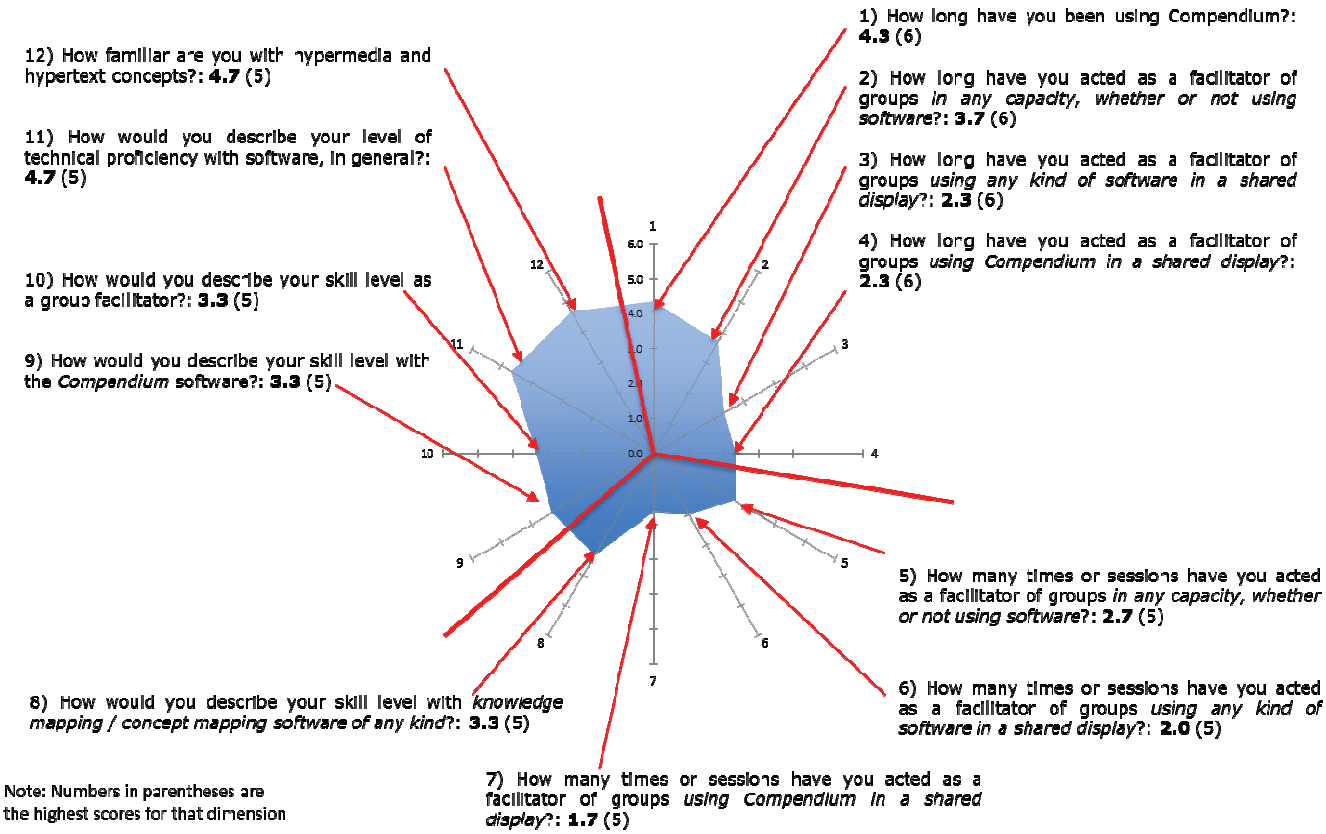
17) How much attention to textual refinement of shaping: **4**



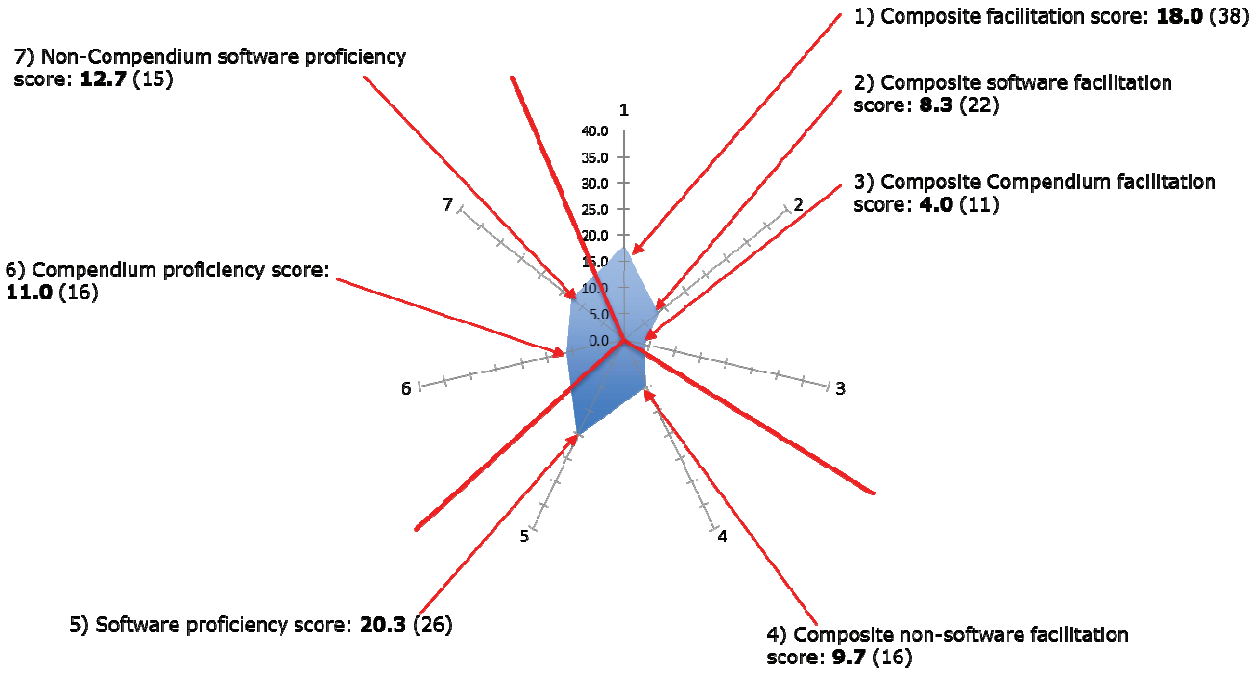
**Framing Analysis**



**Example: Ames Group 3 Questionnaire Data**



**Example: Ames Group 3 Composites**




Note: Numbers ir parentheses are
the highest scores for that dimensior